Maintenance Manual of Chery A113

(Chassis)

Chery Automobile Co., Ltd

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Chapter 1 Brake System

I. System Checking Parameters

1. Check brake disc:

The friction surface of brake disc should be flat and has no apparent grooves; otherwise, brake disc should be replaced.

2. Thickness checking

The standard thickness of front disc (ventilation disc) is 17 mm with its operating limit of 15 mm; when exceeding the operating limit, the front disc should be replaced.

3. Checking of brake friction lining thickness

Standard thickness of front brake lining shall be 10 mm, application limit shall be 1 mm, and the remaining thickness of limit brake pad thickness shall be not less than 1mm.

Standard thickness of rear brake lining shall be 5 mm, application limit shall be 1 mm, and the remaining thickness of limit brake pad thickness shall be not less than 1 mm.

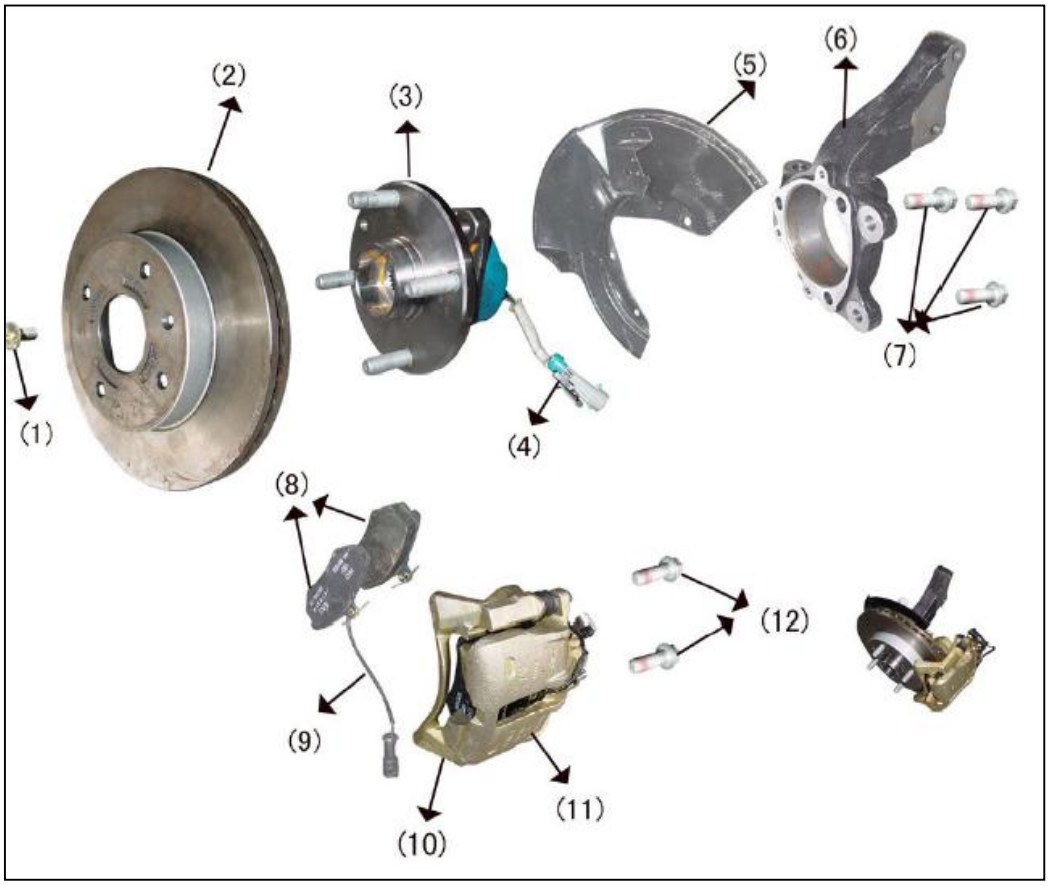
4. Checking of brake disc run-out

Use dial gauge to check the face runout of brake disk, the application limit of front disk shall be 0.03mm, the application limit of rear disk shall be 0.03mm, otherwise replace it.

Important notice:
After completion of replacing friction lining or brake disk, apply the brake for several times to enable breaking-in between brake lining and brake disk. Always ensure safety!
After replacing brake lining, check brake fluid level to ensure it is between MIN and MAX.

II. Removal/Installation and Overhaul of Front Brake and Brake Calliper

1. System Structural Diagram



Structural Diagram of Front Brake Assembly

(1) Brake disc positioning bolt
(2) Brake disc
(3) Wheel hub bearing unit;
(4) ABS speed sensor plug
(5) Dust cover
(6) Steering joint
(7) Fixing bolt
(8) Friction lining
(9) Friction lining thickness sensor plug
(10) Brake bracket
(11) Brake calliper assembly
(12) Fixing bolt

2. Preparations

Tools: Ratchet wheel, ratchet lever, 13#, 14#, 16#, 18#, 19#, 8#, 30# socket, 10#, 13#, 14#, 16# ring wrench, vice, torque wrench, measure ruler..
Accessories: brake fluid

3. Notices

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 The brake liquid is one toxic liquid. In event of contact with the skin or eyes due to carelessness, flush with a great amount of water and if necessary call for medical treatment timely.
3.3 The scrapped brake liquid should be accommodated in the container. It's prohibited to drain it into the sewage system or stack with other household garbage.
3.4 Do not depress the brake pedal nor move the vehicle during the removal/installation operation.
3.5 Do not make the friction lining or brake disc come contact with the oil substances, which will impair the braking effects.

4. Removal and Overhaul

4.1 Remove the protective cover from the tire rim with slotted screwdriver.

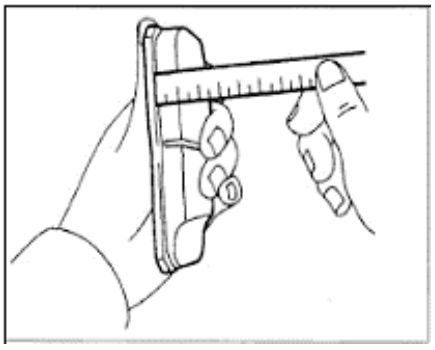
4.2 Remove the tire fixing nuts with 19# torque wrench or vehicle attached tool and remove the tire.
Torque: 110±10 Nm.

4.3 Lift the vehicle with elevator.
4.4 Remove the 2 nuts (upper and lower) from the brake calliper and steering joint with 18# wrench.

4.5 Remove the nuts from brake hose with 13# wrench.
Notice: The brake liquid is one toxic liquid. Do not splash the brake liquid to the clothes or skin during the removal of the brake hose.
Torque: 16±3 Nm.

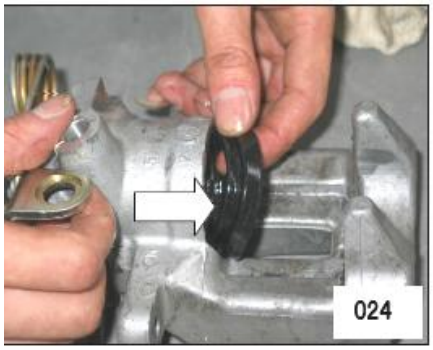
4.6 Pull out the brake disc with hand.

4.7 Measure the thickness of friction lining. If below 3mm, replace timely in pairs.

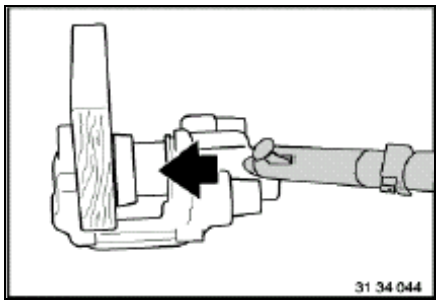


4.8 Remove the brake calliper and brake pump with 14# wrench.

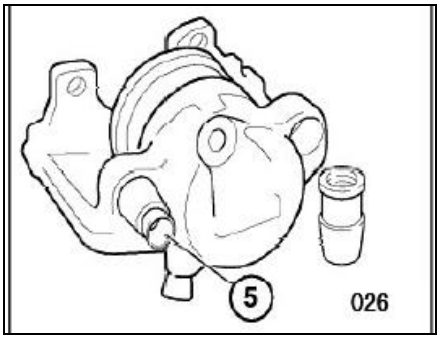
4.9 Remove the dustproof seal and check for the damage of the dustproof seal. If necessary, renew the dustproof seal. Clean the contact surface of the brake piston and apply with one film of silencing grease.
Notice: It's prohibited to make the dustproof seal come contact with the silencing grease, which will cause the swelling of the dustproof seal.



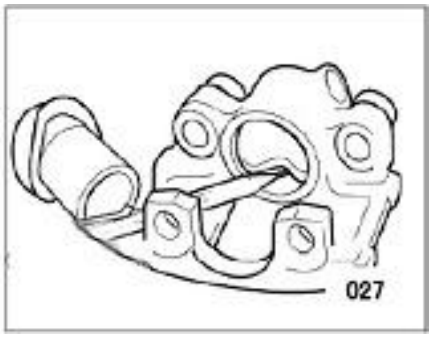
4.10 Remove the piston. Prepare one wood board to hold the piston and place the wood board between the piston and the wall of the brake calliper. Press out the piston with the compressed air carefully through the connecting bore. Place the guard plate (such as hard wood) at the notch of the brake calliper to protect the piston.
Notice: Do not hold the piston with fingers – danger of clamping! The brake calliper piston is prohibited from removal at will and should be removed/installed only by professionals or under the guidance of the professionals.



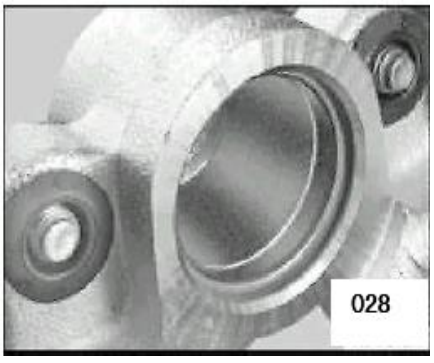
4.11 Check the guide sleeve. The guide sleeve should move smoothly and freely when pushed with hand. Replace the guide sleeve in event of jamming or stiffness. Notice: Apply the lubricating grease onto the guide sleeve during assembling.



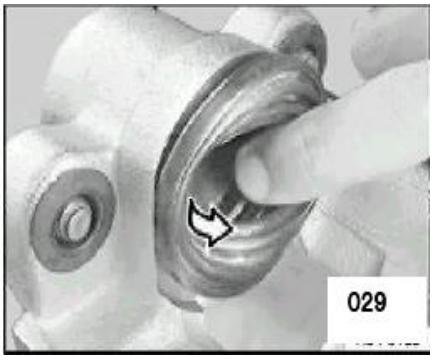
4.12 Remove the seal ring carefully with the plastic needle, clean the brake cylinder and components with alcohol and blow dry with compressed air. Carefully check the surfaces of brake cylinder, piston, and flange. It's prohibited to conduct the machining process on the brake cylinder and piston.



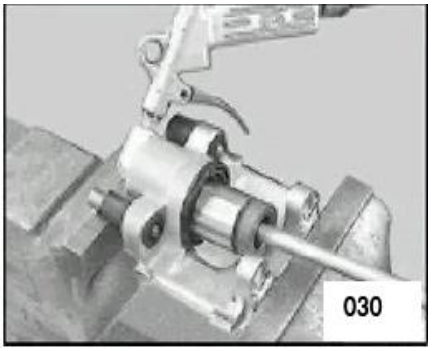
4.3 Installation of brake branch pump: Apply one film of brake cylinder cream onto the cylinder body, plunger, and seal sleeve. Attach the seal ring onto the circular groove at the rear of the brake cylinder. Attach the dustproof seal ring onto the front circular groove and press it in completely.



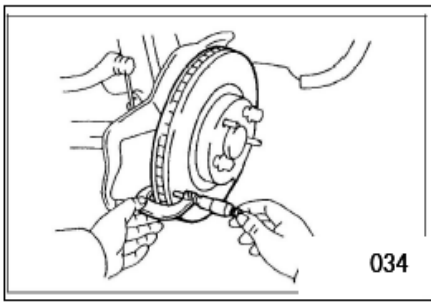
4.14 The area between the dustproof seal ring and the brake clamp housing must be kept dry. It should be kept away from the brake cylinder cream or the brake liquid, in order to ensure the correct position of dustproof seal ring.



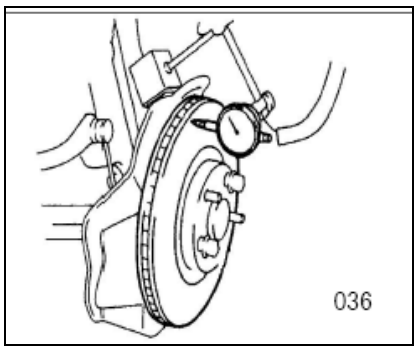
4.15 Secure the brake piston with the reinforcement parts available in market and press it onto the dustproof seal ring slightly. Blow the dustproof seal ring with compressed air (up to 3.0bar) to attach the piston ring onto the piston.
Notice: Dip the dustproof seal ring and piston with brake liquid to facilitate the passing of the seal ring.



4.16 (Checking of brake disc) Check the thickness of brake disc. Replace the brake disc if the thickness is less than the min thickness.
Notice: The two brake discs at the same axle should be replaced at a time. The friction linings must be replaced following the replacement of the brake discs.



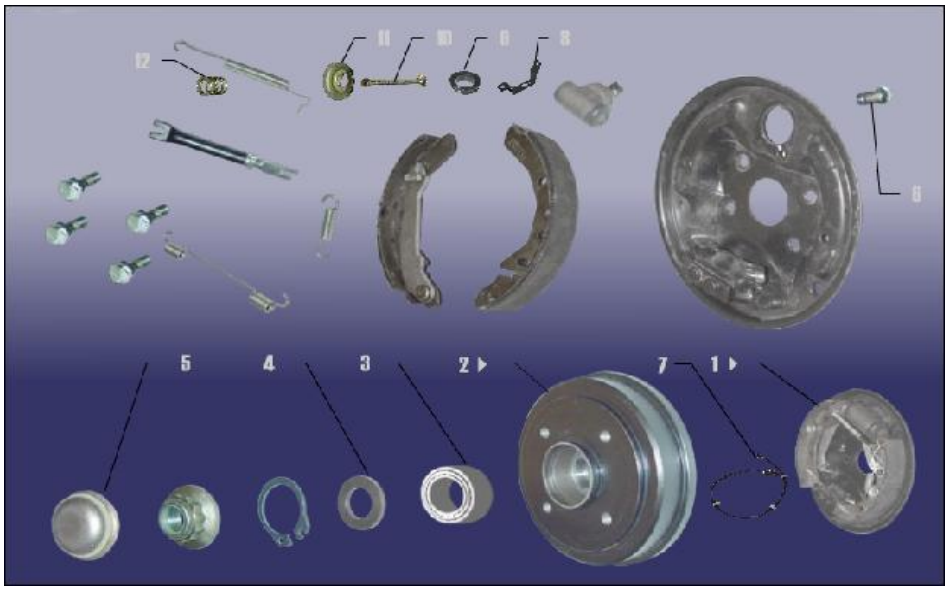
4.17 Check the max run-out of the end surface of brake disc with dial gage. If above 0.03mm, replace it. (Provided that the brake disc thickness is guaranteed, it may conduct the proper machining to meet with the max run-out.)



4.18 Installation of other portions with reference to the Removal Procedure.

III. Removal/Installation and Overhaul of Rear Brake

1. System Structural Diagram



1. Rear brake assembly
2. Brake drum
3. Rear wheel hub bearing assembly
4. Oil seal
5. End cap
6. Bolt
7. Rear wheel sensor
8. Rear brake hose retaining clip
9. Dual-port pipe clip
10. Tie rod
11. Rear shoe pressure spring plate
12. Rear shoe pressure spring

2. Preparations

Tools:

Ratchet wheel, ratchet lever, 10#, 19#, 32# socket, 10# ring wrench, vice, torque wrench, slotted screwdriver.

Accessories: brake fluid

3. Notices

3.1 Please wear necessary labor protection supplies to avoid accidents.

3.2 The brake liquid is one toxic liquid. In event of contact with the skin or eyes due to carelessness, flush with a great amount of water and if necessary call for medical treatment timely.

3.3 The scrapped brake liquid should be accommodated in the container. It's prohibited to drain it into the sewage system or stack with other household garbage.

3.4 Do not depress the brake pedal nor move the vehicle during the removal/installation operation.

3.5 Do not make the friction lining or brake disc come contact with the oil substances, which will impair the braking effects.

4. Removal Procedure

4.1 Remove the rear wheels (see the removal procedure of front wheels).
4.2 Remove two position bolts from the brake drum with the cross screwdriver.

4.3 Remove the bearing dust cap with slotted screwdriver.

4.4 Vibrate the brake drum to remove it.

4.5 Observe the rear braking structure.

4.6 If it's necessary to check the brake drum bearing, remove the lock nuts shown in the figure with 30# socket and torque wrench and remove the brake drum bearing.
Torque: 250±10 Nm

4.7 Remove the handbrake cable with calliper.

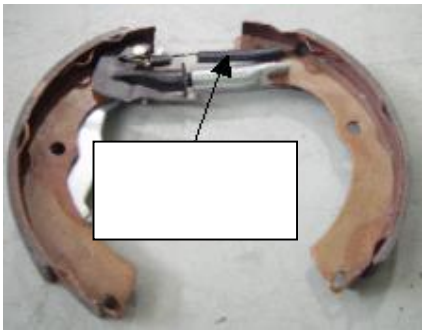
4.8 Remove the upper return tension spring with calliper.

4.9 Remove the lower return tension spring with calliper.

4.10 Depress the spring strip of the brake shoe positioning tie rod with calliper and then rotate clockwise or counter clockwise for 90° to remove two brake shoe position tie rods.

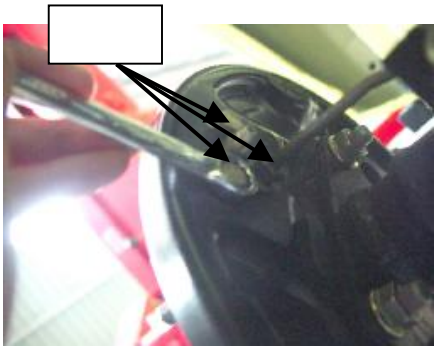
4.11 Pull out two brake shoes.

4.12 Remove the tension spring to separate the brake shoe.



4.13 In the event of detection of over-tight rear brake, it may adjust the length of the push rod: Rotate clockwise to eliminate the friction.

4.14 Remove the three bolts shown in the figure with 10# ring wrench.



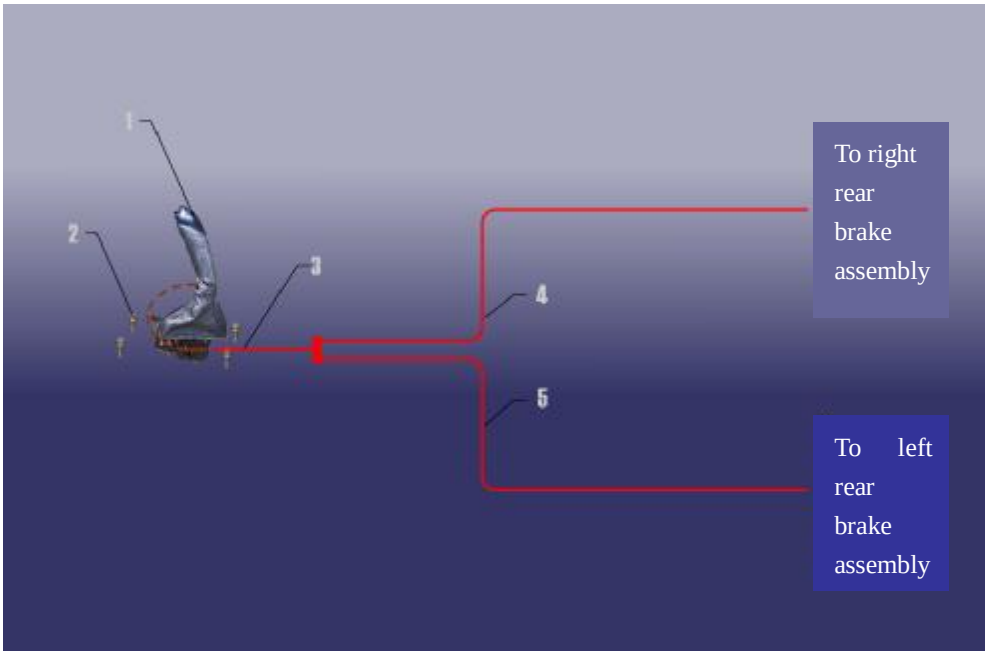
4.15 Remove the branch pump and break it down for checking of intactness.

4. Installation Procedure

Refer to removal procedures.

IV. Adjustment and Replacement of Handbrake

1. System Composition Illustration



1. Handle 2. Fixing bolts 3. Cable 4, 5. Left/Right rear wheel cable

2. Preparations

Tools: Ratchet wheel, ratchet lever, 10#, 13#, 14#, 16# socket, 10#
13#, 14# ring wrench, vice, torque wrench, slotted screwdriver.

3. Notices

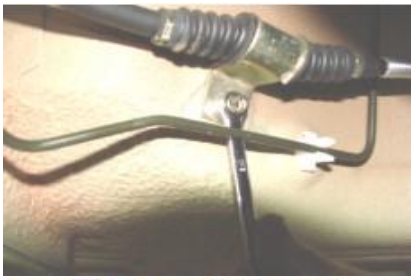
3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 During the removal/installation of the spring parts, enough cautions should be taken to prevent the ejection of such parts from causing body injuries.
3.3 The removal/installation at the vicinity of the exhaust pipe must be conducted only after the temperature of the exhaust pipe is lowered to normal temperature so as to prevent scald.

4. Removal/Installation Procedure

4.1 With reference to the removal/installation of the rear brake, loosen the handbrake cable of the rear wheels.

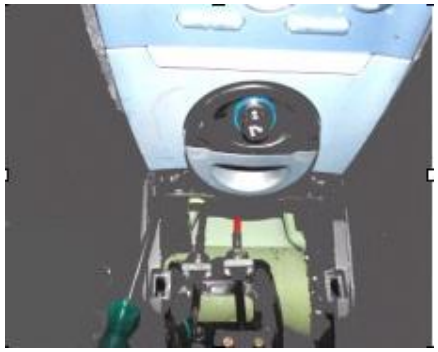
4.2 Remove the handbrake clip with priers.
Notice: It’s under the rear wheels.

4.3 Remove the fixing bracket bolts of the handbrake cable shown below with 8# ring wrench.
Torque: 9~12 Nm



4.5 Pry out the protective cover at the handbrake and gear position with slotted screwdriver.

4.6 Remove all fixing screws from the secondary instrument panel assembly with ring screwdriver to remove the secondary instrument panel assembly.



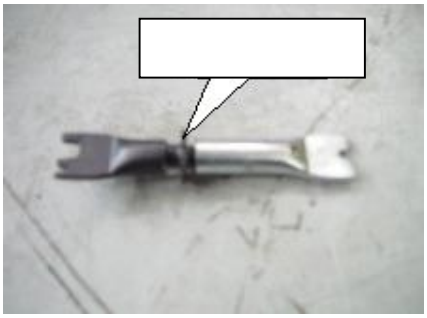
4.7 Remove the handbrake adjustment nuts with 10# wrench.

4.5 Loosen the two handbrake cables with hand.

4.9 Pull out the handbrake cable from the underside of the vehicle body.

Notice: Remove the handbrake cable at another side in accordance with the same method.

4.10 **(Handbrake adjustment)** The length of the handbrake cable equipped on this model is designed to be the fixed length. To adjust the handbrake effects, refer to the part “removal of rear brake”. The adjustment of the ejector rod length (clockwise for looseness and counter clockwise for tightness) can achieve the handbrake adjustment.



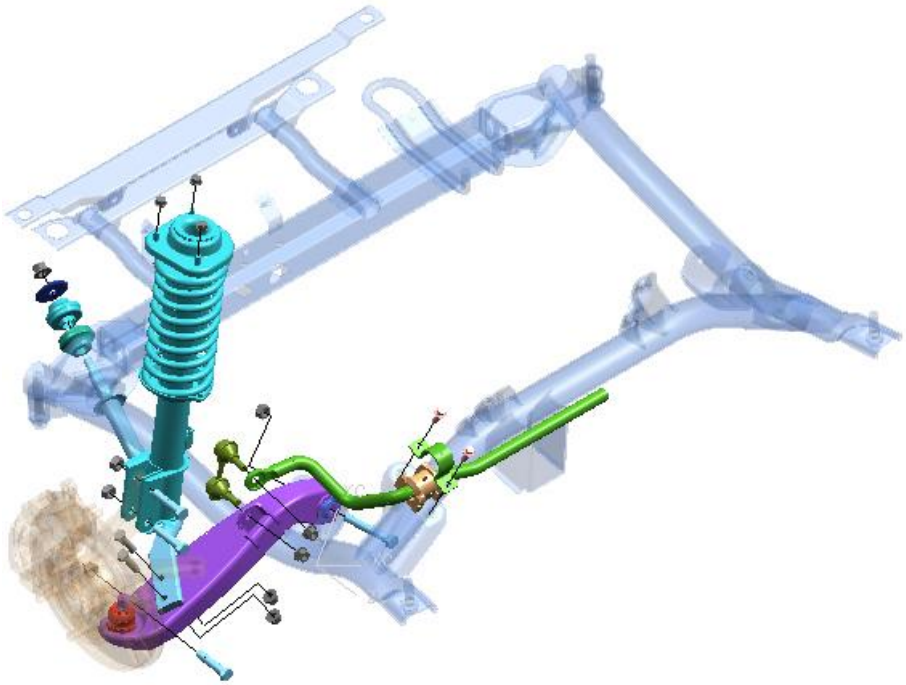
4.11 The installation procedure should be conducted with reference to the removal procedure.

Chapter 2 Adjustment of Suspension System and Four-Wheel Alignment

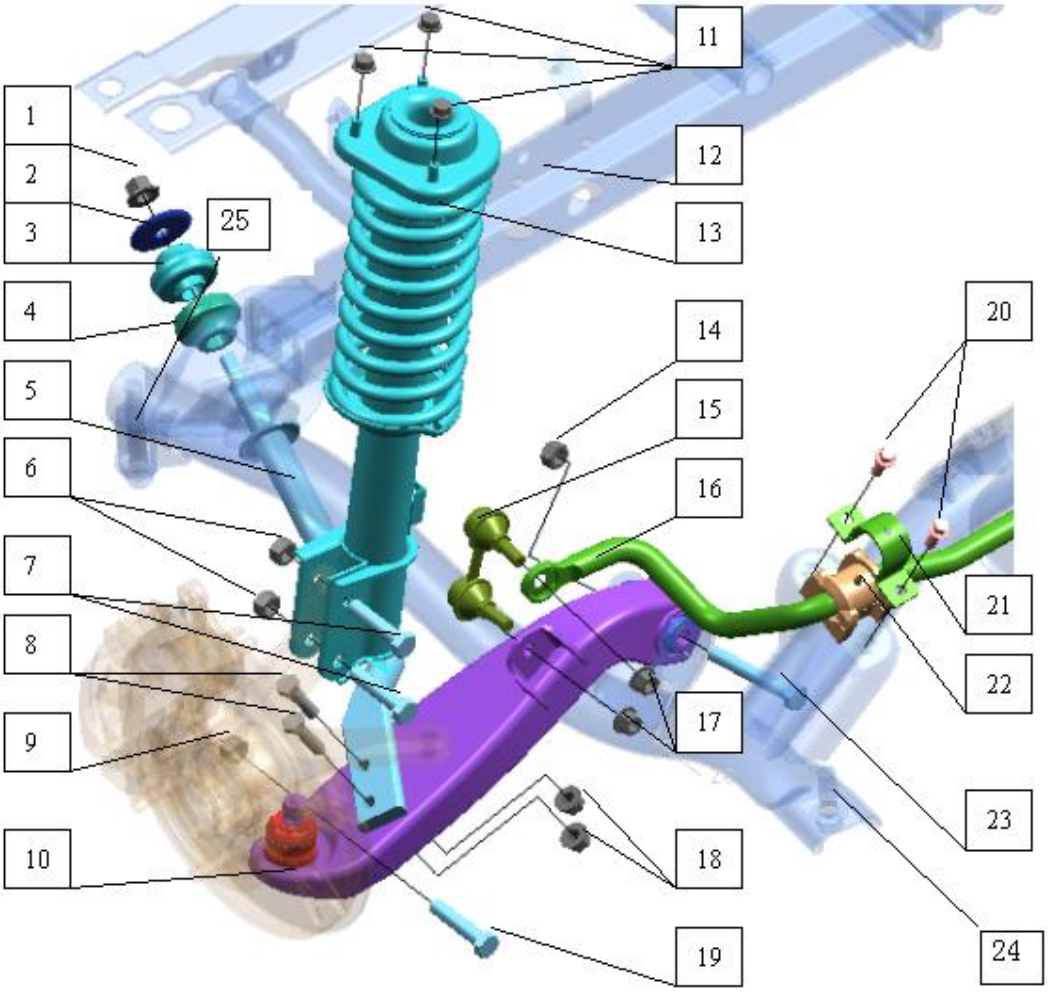
I. Removal/Installation and Overhaul of Front Axle and Suspension

1. System Structural Diagram

The front axle of Chery S21 model adopts the split steering drive axle, with MacPherson independent suspension. The upper end of the suspension is connected with the vehicle body as the lower end is connected with the secondary vehicle frame. The front Macpherson suspension undertakes the dual functions of driving and steering. Subframe connects with vehicle body via elastic element, which improves diving stability and ride comfort.



Structural diagram of Front Axle and Suspension System



1	Nut	9	Nut	17	Nut
2	Gasket	10	Left control arm	18	Nut
3	Rubber gasket I	10	Right control arm	19	Bolt
4	Rubber gasket II	11	Nut	20	Bolt
5	Left propelling rod weldment assembly	12	Secondary vehicle frame	21	Clamp
5	Right propelling rod weldment assembly	13	Front strut assy.	22	Rubber bush
6	Nut	14	Nut	23	Bolt
7	Bolt	15	Front connecting rod assy.	24	Bolt
8	Bolt	16	Front stabilizer bar	25	Bolt

Composition List for Front Axle and Suspension System

2. Preparations

Tools: 8#, 15#, 18#, 19# socket; 10#, 13#, 15# wrench.

3. Notices

2.1 Please wear necessary labor protection supplies to avoid accidents.
2.2 When carry out maintenance and repair to chassis, please note that whether the safety lock of lifting machine is locked.
2.3 When carry out removal/installation to shock absorber spring, prevent spring ejection from being injured.
2.4 It's prohibited to conduct the welding and correction on the bearing components of the wheel suspension and the guiding components of the wheels.
2.5 During the removal of the chassis component, renew the self-lock nuts and rusted nuts so as to guarantee the safety.

4. Removal/Installation Procedure

4.1 Removal of shock absorber assembly

4.1.1 Remove the tire fixing nuts with 19# socket or vehicle attached wrench to remove the tire (take left side for instance).
Torque: 110±10 Nm

4.1.2 Remove the ABS pipeline from the fixing seat with hand.

4.1.3 Remove the fixing bolts of steering joint and shock absorber with 18# socket.
Torque: 110±10 Nm

4.1.4 Remove the three fixing bolts of shock absorber assembly from the vehicle frame with 13# socket.
Torque: 60±5 Nm

4.1.5 Remove the shock absorber assembly.

4.2 Removal of Control Arm Assembly

4.2.1 Remove the fixing bolts of front connecting rod assembly from the control arm with 15# socket.

Torque: 100±10 Nm

4.2.2 Remove the connecting bolts of front propelling rod and control arm with 15# wrench.
Torque: 75±5 Nm

4.2.3 Remove the ball joint fixing bolts from control arm and steering universal joint with 18# socket and 18# ring wrench.

Torque: 100±10 Nm

4.2.4 Remove the connection bolts of control arm and front axle with 18# socket to remove the control arm assembly.

Torque: 150±10 Nm

4.3 Removal of Front Axle Assembly

4.3.1 Remove the fixing bolts from the chassis mud guard to remove the mud guard assembly.

Torque: 3±0.5 Nm

4.3.2 Remove the front bracket bolts of the transmission from the secondary vehicle frame with 19# socket.
Torque: 110±10 Nm

4.3.3 Remove the rear bracket bolts of the transmission from the secondary vehicle frame with 19# socket.
Torque: 110±10 Nm

4.3.4 Remove the two connecting bolts of front exhaust pipe with 15# socket.
Torque: 50±5 Nm

4.3.54 Remove the two connecting bolts of front exhaust pipe and rear muffler with 15# socket.

Torque: 50±5 Nm

4.3.6 Remove the fixing bolts at the right side of the booster steering gear with 13# wrench.
Torque: 75±5 Nm

4.3.7 Remove the fixing bolts at the left side of the booster steering gear with 15# wrench.
Torque: 75±5 Nm

4.3.8 Remove the fixing bolts of propelling rod and secondary vehicle frame with 19# socket.
Torque: 105±10 Nm

4.3.9 Remove the fixing bracket of the A/C pipeline from the secondary vehicle frame with 10# wrench.
Torque: 25±2.5 Nm

4.3.10 Remove the fixing bracket of the condenser from the secondary vehicle frame with 13# wrench.
Torque: 45±5 Nm

4.3.11 Remove the four connecting nuts of secondary vehicle frame and vehicle body with 18# socket to remove the front axle assembly.

Torque: 150±10 Nm

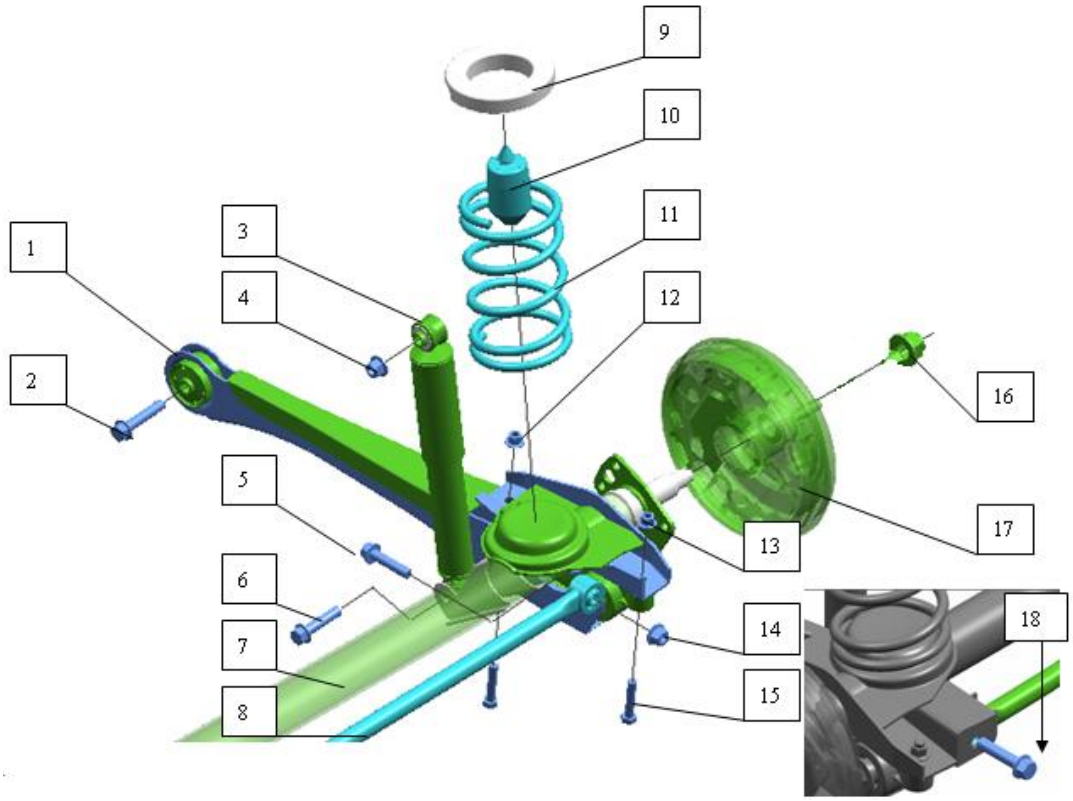
4.3.12 Remove the fixing bolts and nuts from the rubber sleeve of the stabilizer rod with 10# wrench.
Torque: 50±5 Nm

5. Installation Procedure

Refer to the removal procedures of front axle and front suspension.

II. Removal/Installation and Overhaul of Rear Axle and Suspension

1. System Structural Diagram



1	Rear trailing arm assembly	7	Rear shaft welding assembly	13	Nut
2	Bolt	8	Cross stay assembly	14	Nut
3	Rear shock absorber assembly	9	Rear spring cushion	15	Bolt
4	Nut	10	Rear bumper block	16	Lock nut
5	Bolt	11	Rear coil spring	17	Rear brake band drum assembly
6	Bolt	12	Nut	18	Bolt

Structural diagram of Rear Axle and Suspension System

2. Preparations

Tools: 11#, 13#, 15#, 16#, 16#, 19#, 30# socket, Slotted screwdriver, priers.

3. Notices

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 Notice to lock the safety lock of the elevator during the repair of the chassis.
3.3 When carry out removal/installation to shock absorber spring, prevent spring ejection from being injured.

4. Removal/Installation Procedure

4.1 Removal of Shock Absorber Assembly and Shock Absorber Spring.

4.1.1 Remove the tire fixing nuts with 19# torque wrench or vehicle attached wrench to remove the tire (take left side for instance).
Torque: 110±10 Nm

4.1.2 Remove the connecting bolts of shock absorber assembly and rear axle with 18# socket.
Torque: 100±10 Nm

4.1.3 Remove the connecting bolts of shock absorber assembly and vehicle body with 18# socket to remove the shock absorber assembly.

Torque: 100±10 Nm

4.1.4 Pry out the rear coil spring with screwdriver.

4.1.5 Vibrate from side to side with force with hand to remove the rear bumper block.

4.2 Cross Stay Assembly

4.2.1 Remove the connecting bolts of cross stay and left side of vehicle body with 16# socket.
Torque: 100±10 Nm

4.2.2 Remove the connecting bolts of cross stay and right side of vehicle body with 15# socket to remove the cross stay assembly.
Torque: 100±10 Nm

4.3 Rear Trailing Arm Assembly

4.3.1 Remove the connecting bolts from the rear side of rear axle and trailing arm assembly with 13# socket.
Torque: 100±10 Nm

4.3.2 Remove the connecting bolts from the middle side of rear axle and trailing arm assembly with 13# socket.
Torque: 100±10 Nm

4.3.3 Remove the connecting bolts of trailing arm and vehicle body with 15# wrench to remove the rear trailing arm assembly.
Torque: 100±10 Nm

4.4. Removal of Rear Axle Assembly

4.4.1 Remove the connecting bolts of brake pipeline and rear axle with 11# socket. Notice the storage of brake liquid.
Torque: 16±3 Nm

4.4.2 Remove the rear brake band drum assembly.

4.4.3 Remove the handbrake cable with priers.

4.4.4 Remove the lock nuts from the rear brake band drum assembly with 30# socket to remove the rear brake band drum assembly.
Torque: 180±10 Nm

4.4.5 Remove the rear axle assembly.

5. Installation Procedure

The installation procedure is reverse to that of removal.

III. Adjustment of Four-Wheel Alignment

Please conduct the measurement and adjustment of parameters on the four-wheel alignment instrument recommended by Chery Auto.

1. Adjustment of Front Wheel Toe-In

The toe-in can be adjusted by means of the optical testing instrument or mechanical toe-in adjustment instrument.

1.1 Depending on the requirements of the testing instrument, conduct the pre-adjustment preparations for the wheel alignment;

1.2 Loosen the lock nuts of right steering track rod and the spring clips of protective sleeve. Based on the demands, rotate the toe-in adjustment rod to adjust the length, till reach the specified value.

Toe-in value: 6′±6′

1.3 Tighten the lock nuts and install the spring clips of the protective sleeve. Check if the lock nuts are properly tightened and the protective sleeve is in right position;

Torque: 35±3 Nm

1.4 At the finish of toe-in adjustment of front wheels, check the steering wheel for levelness. Otherwise, loosen the lock nuts of the steering wheel, adjust the steering wheel to level position, and then tighten the lock nuts of the steering wheel to the specified torque.

2. Adjustment of Front Wheel Camber Angle

2.1 Under normal conditions, it's unnecessary to adjust the camber angle after the assembling of independent suspension and wheel steering joint. In case the wheel camber angle is out of the tolerance scope due to other reasons, it may be calibrated by means of the connecting bolts of independent suspension and steering joint.

Front wheel camber angle: 0.87°±50′

2.2 Before the calibration, check (visual observation) the driving system components for damage and replace the damaged parts.

2.3 In case the front wheel camber angle is out of tolerance, loosen the connecting bolts of front shock absorber and steering joint and move the wheels for correction.

3. Adjustment of Caster Angle and Kingpin Inclination

The caster angle and the kingpin inclination are guaranteed by the designed structure and are free of adjustment during use.

Caster angle: 3.4°±30′
Kingpin inclination: 12.7°If the parameters are out of the specified range, replace the steering joint.

4. Adjustment of Rear-Wheel Alignment Parameters

All of the rear wheel positional parameters shall be guaranteed through design process.
4.1 Rear wheel camber angle: 0°±30′
4.2 Rear wheel toe-in: 0°±10′
4.3 If the deformation of rear shaft arising from the great impact force causes the change of rear wheel alignment parameters that out of the specified range, correct the rear axle or replace the rear axle.

IV. Tire Installation and Air Pressure Adjustment

1. Installation of Air Valve

Prior to installing tire valve, firstly check the valve port to ensure whether it is smooth and free from burr, and then apply glycerol on the rubber body surface, or soak the tire valve into glycerol. Pull or press (200 - 400N) using special tools to make the locating ring of the valve can go through the wheel holes, to this point, the assembly is completed (soap water is allowed to substitute glycerol).

2. Tire Assembling

Before fit the tire, apply glycerol or soap water along the cycle of tire bead, meanwhile, note that:
2.1 When there is colored dot on the wheel rim, align the uniformity testing mark of tire to the colored dot mark of wheel rim.
2.2 When without colored dot on the wheel rim, align the dynamic balance testing mark of tire to valve position.
2.3 When without colored dot on the wheel rim, additionally, there is no dynamic balance testing mark, however, static balance testing mark is available, at this point, align the tire valve to the static balance testing mark.
2.4 The description concerning the uniformity, dynamic balance and static balance testing marks for tires will be additionally provided in writing by the product division of Chery Company or suppliers. In addition, this kind of descriptions will clearly be indicated on process sheet.

2.5 Carry out tire inflation strictly in accordance with specified pressure. During inflating process, air pressure shall not exceed 10% of rated pressure. When performing separate packaging to spare wheel assembly, the rated inflation pressure shall be 3.0bar, and the spare wheel assembly shall be stored separately from four wheels. Before the four-wheel alignment, check the air pressure of all wheels and adjust the air pressure: 2.3bar for front wheels and 2.1bar for rear wheels.

3. Tire Inflation

After completion of tire inflation, screw up the protective cap of valve, and then carry out dynamic balancing test. Fit appropriate balance weight at the internal and external fringe of wheel rim as required. It is required that the unbalancedness of the final assembly shall be less than 100g • cm, which is approximately equivalent to a 5g balance weight at the internal and external fringe of wheel rim. Note: each wheel and each side can use only one balance weight. Additionally, its maximum mass shall not be more than 70g. During assembling process, never hit the balance weight too heavy. Otherwise, replace balance weight in time. In addition, never use the replaced balance weight again.

4. Installation of Wheel and Tire Assembly.

When fixing wheel and tire assembly, first, manually screw up the wheel bolt onto the hub for pretension, after that use special tools for tightening in accordance with diagonal process. Tightening torque shall be 110±10N.m. It is prohibited to use impact wrench to prevent from wheel damage, over loose or over tight. It is not allowed to apply grease on wheel bolt (For new installed wheel and tire assembly, the wheel bolts should be tightened at first running of 100km to guarantee the tightening torque. The tightening torque checking of wheel bolts is one of the items of regular maintenance)

5. Tightening Method of Wheel Nuts

Tighten the fixing nut in a decussate way, the tightening force shall be approximately equal, then wheel shall be able to turn freely.
When carry out final tightening, the wheel shall be on the ground.

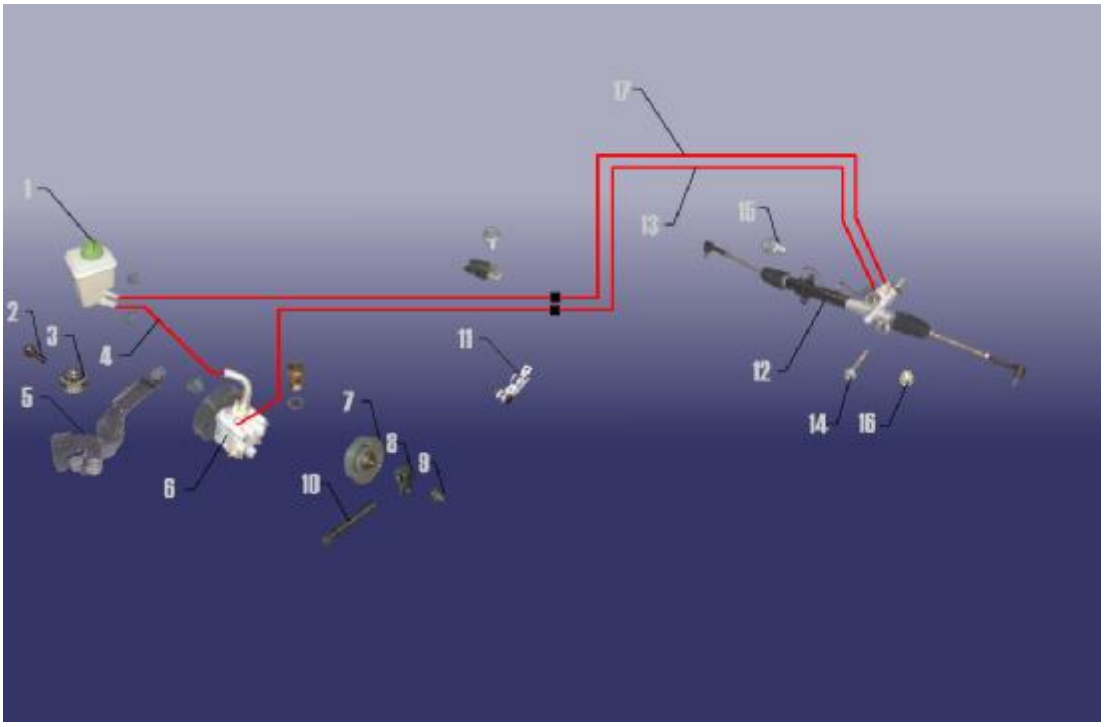
6. Installation of Decorative Cover

Mount trim cover or place trim cover as required. When fitting clip-type trim cover, place knock in position by hand or via rubber tools.

Chapter 3 Removal/Installation and Overhaul of Steering System

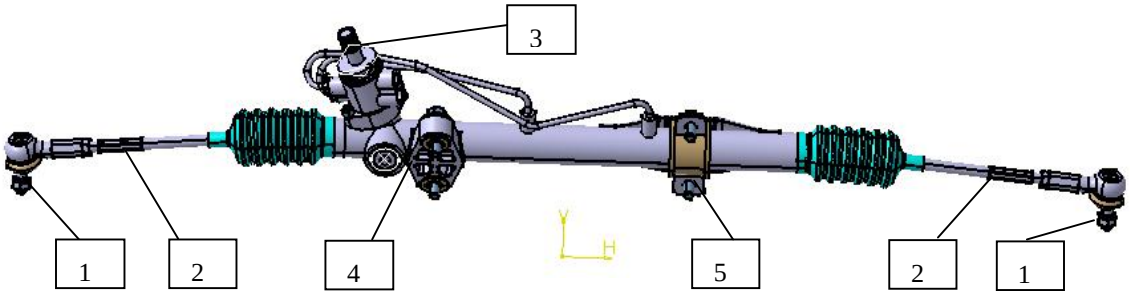
I. Removal/Installation of Steering Gear

1. System Composition Illustration



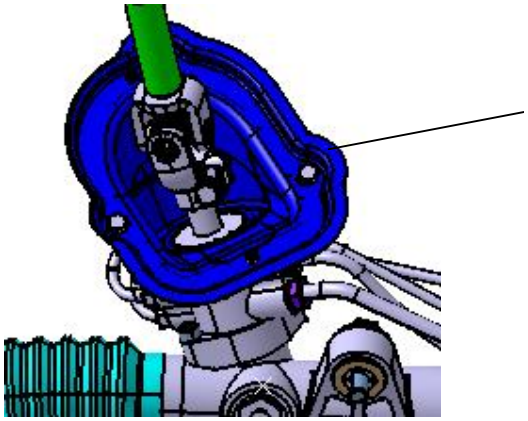
1. Booster steering liquid reservoir
2. Bracket fixing bolt
3. Bracket fixing nut
4. Outlet pipeline
5. Reservoir fixing bracket
6. Steering pump
7. Tensioner
8. Lock nut
9. Adjustment nut
10. Adjustment tie rod
11. Pipe clamp
12. Steering gear
13. Outlet pipeline
14. 15. Fixing bolt
16. Fixing nut
17. Return pipeline

The breakdown illustration of steering gear is shown below:



1 – Lock nuts 2 – Track rod 3 – Input shaft 4 – Left installation bracket 5 – Right installation bracket

The illustration of steering universal joint and protective sleeve is shown below:



S21-3404060
(Steering universal knuckle protective sleeve assembly)

2. Preparations

Tools: 13#, 19# socket wrench, 12#, 13#, 17# non-adjustable wrench.
Accessories: power steering fluid

3. Notices

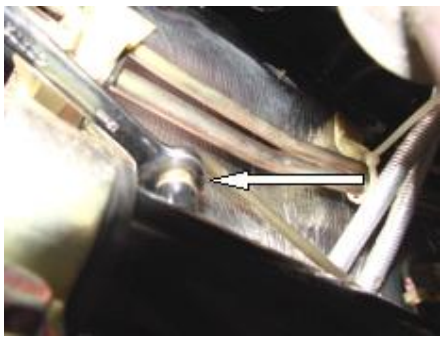
3.1. Please wear necessary labor insurance products in order to avoid the accidents.
3.2 Avoid steering fluid to contact with skin or eyes when disassembling steering system.

4. Removal/Installation Procedure

4.1 Remove the fixing nuts at the both sides of steering ball joint with 19# socket.
Torque: 40±5 Nm

4.2 Loosen the fixing nuts under the booster steering hose with 17# non-adjustable wrench.
Torque: 25±5 Nm

4.3 Loosen the fixing nuts above the booster steering hose with 12# non-adjustable wrench.
Torque: 25±5 Nm



4.4 Remove the fixing screws above the right bracket of power steering gear with 13# socket.
Torque: 100±10 Nm

4.5 Remove the fixing screws under the right bracket of power steering gear with 13# socket.
Torque: 100±10 Nm

4.6 Remove the fixing screws above the left bracket of power steering gear with 13# socket.
Torque: 100±10 Nm

4.7 Remove the fixing screws under the left bracket of power steering gear with 13# socket.
Torque: 100±10 Nm

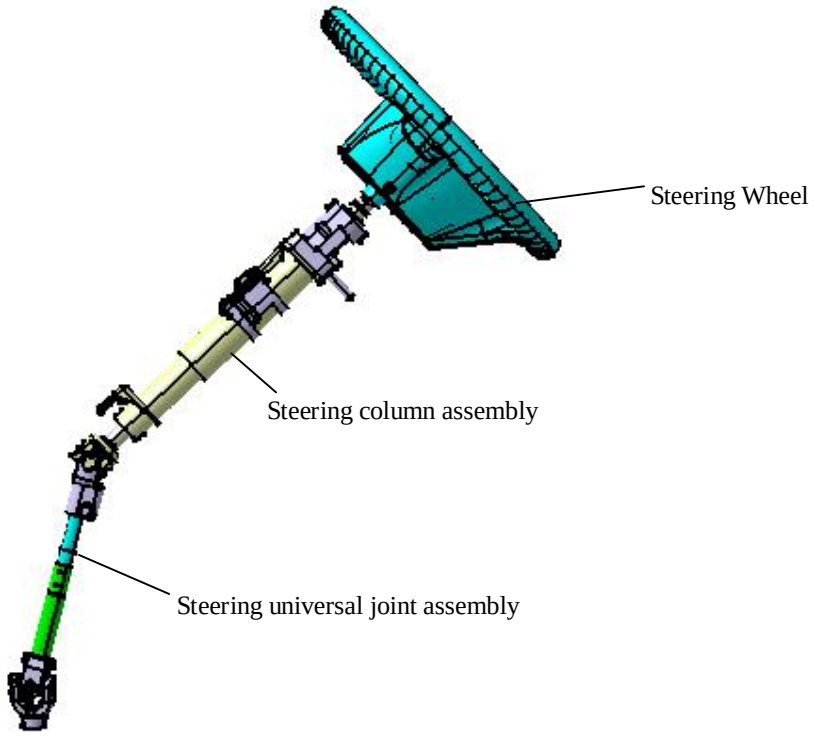
4.8 Remove the fixing bolts of the steering universal joint with 10# socket wrench to remove the steering gear assembly.

5. Installation Procedure

Refer to removal procedures.

II. Removal/Installation of Steering Column

1. System Composition Illustration



1 – Steering wheel 2 – Steering column assembly 3 – Steering universal joint assembly

2. Preparations

Tools: Cross screwdriver, 5#, 6# inner hex wrench, 10#, 13#, 22# socket wrench.

3. Notices

3.1 Please wear necessary labor protection supplies to avoid accidents.
3.2 Avoid steering fluid to contact with skin or eyes when disassembling steering system.
3.3 Before disassembling steering wheel, disconnect negative of battery cell to avoid airbag ejection.

4. Removal Procedure

4.1 Loosen the two screws under the steering wheel with 5# inner hex wrench.

4.2 Remove the horn cover from the steering wheel.

4.3 Remove the fixing nuts of the steering wheel with 22# socket wrench.

4.4 Remove the steering wheel after screw off the nuts.

4.5 Screw off the two screws from the front surface of combined switch guard plate with cross screwdriver.

4.6 After screw off the screws, open upward to remove the upper protective cover.

4.7 Screw off the three screws from the lower side of combined switch guard plate with cross screwdriver.

4.8 Remove the lower protective cover after screw off the screws.

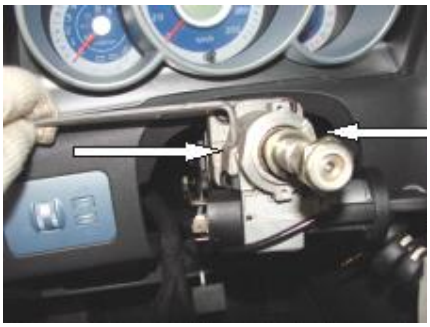
4.9 Remove the two fixing screws from the combined switch with cross screwdriver.

4.10 Pull out all plugs from the combined switch. (Total 5 plugs)

4.11 Remove the combined switch.

4.12 Pull out the plug of ignition switch.

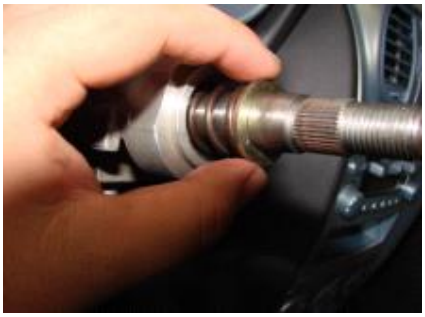
4.13 Screw off the fixing screws from ignition lock with 5# inner hex wrench and remove the ignition lock assembly.



4.14 Screw off the 4 fixing screws from the upper end cap with 6# inner hex wrench.

4.15 Remove the outer caliper with the outer caliper pliers.

4.16 Remove the retainer and spring with hand.



4.17 Remove the upper end cap with hand.

4.18 Remove the two upper fixing nuts from the steering column with 13# socket.
Torque: 25±3 Nm

4.19 Remove the two lower fixing nuts from the steering column with 13# socket.
Torque: 25±3 Nm

4.20 Remove the connecting nuts of steering column and steering universal joint with 10# socket to remove the steering column assembly.

Torque: 25±3 Nm

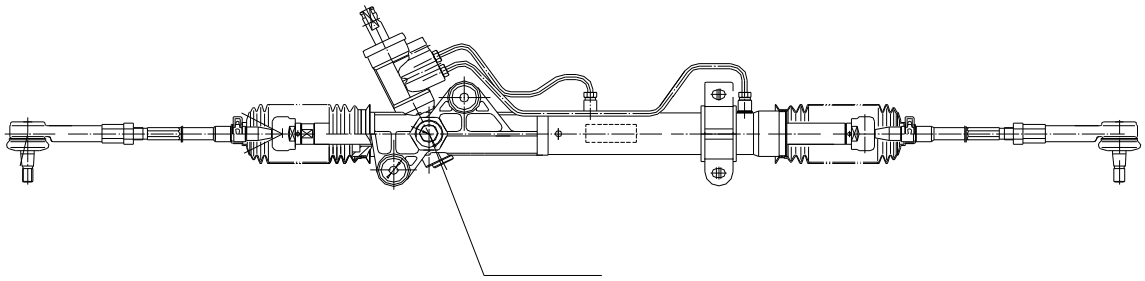
4.21 Remove the connecting bolts of steering universal joint and steering gear with hand.
Take out steering universal joint assembly.

5. Installation Procedure

Refer to removal procedures.

III. Adjustment of Steering Gear Clearance

1. Place the wheels at linear driving position;
2. Rotate the steering wheel towards both sides;
3. If heard noise of steering gear, adjust the screw as shown in the diagram until no impinge noise is heard when turning steering wheel;
4. Tighten the screws for further 1/8 turn (approximate 45°);
5. Carry out the road test;
6. If the steering mechanism can not return to the central position by itself, then loosen the bolt for 15°;
7. Carry out the road test.



IV. Adjustment of Power Steering System

1. Correctly connect power steering oil pipe—where the tightening torque for the connector between oil return pipe, high-pressure oil pipe and steering gear shall be 35±3N.m, the tightening torque of hollow bolt connecting high-pressure oil pipe and power steering pump shall be 45±3N.m. When filling power steering oil, it is recommended to use special purpose vacuum pumping oil. The specifications for filling power steering hydraulic fluid and exhaustion are described as below:

Fill power steering hydraulic fluid into steering reservoir assembly to the maximum level, start engine at low speed (idle speed) to drive the steering pump, the steering system will be quickly full of hydraulic fluid. In the oil filling process, only let engine run at idle speed to drive vane pump. Meanwhile, continuously add hydraulic fluid to prevent vane from sucking air due to oil level drops.

2. When hydraulic fluid in the oil tank presents emulsification state, or the pump emits excessive noise (under normal condition, max. noise shall be 80 db), it must carry out exhaustion process. The exhaustion procedure is described as below:

Jack the front part of the vehicle till two front wheels are hung up, start the engine, turn the steering wheel to right and left till reach limit position (caution: after come to the limit position, try not to stop, even if stop, never maintain over 2 seconds). Repeat above action for several times, until the air in the system is gradually exhausted from the oil reservoir. In this process, with the drop of oil level, continuously supplement hydraulic fluid until the oil comes to specified level.

3. Regularly check and adjust the tension of power steering belt: vertically apply a 100N force at the middle of the belt, the max. deflection of belt shall be less than 5 mm, otherwise adjust the belt tension until meet the above requirement via adjusting tension bolt.

4. When in service, it is prohibited to turn the steering wheel to limit position, even if it has to do so, never maintain at this position over 10 seconds. It is strictly prohibited to use power steering pump without oil. If the driver suddenly feels the steering heavy in service, immediately stop the vehicle, dismantle and repair accordingly.

Maintenance Manual of Chery A113

(Body Accessories & Dimensions)

After Sales Service Department of Chery Automobile Sales Co., Ltd

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Chapter I Front Hood & Trunk

I. Removal and Installation of Front Hood

1. Preparations

Tools: Flat head/cross head screwdriver, socket wrench, snipe nose pliers

2. Notes

2.1. During removal and installation, be particularly careful to apply proper strength and no abrupt or violent operation is allowed.

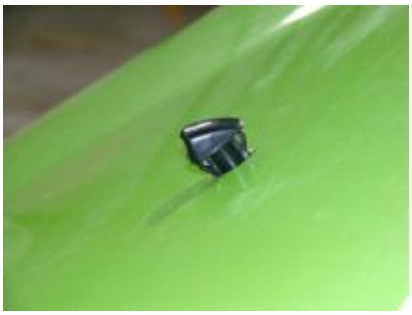
2.2. During removal and installation of the trims, be particularly careful to avoid surface scratch of them.

3. Removal and Installation of Front Hood Accessories

3.1. Removal Steps

3.1.1. Pull off the detergent hose.

3.1.2. Press down the water nozzle clip from under the front hood, and then push it up while removing the noozle outward.



3.2. Installation Steps

The installation steps are reverse to those for removal.

4. Removal & Adjustment of of Front Hood Assembly

Preparation of Tools: 13# sleeve, wheel wrench and extension bar
4.1. Turn and remove the four adjusting bolts off the front hood, and then the front hood can be taken down. And the positing of the front hood can be adjusted in all directions by loosening the four adjusting bolts.

4.2. Installation of Front Hood Assembly:
The installation steps are reverse to those for removal.
Installation torque is 29±3Nm

5. Removal and Installation of Air Inlet Grid Assembly

5.1. Removal Steps

5.1.1. Use the wrench to remove the four fastening screws on the Air Inlet Grid assembly as shown in the picture.

5.1.2. Remove the Air Inlet Grid.

5.2. Installation Steps

The installation steps are reverse to those for removal.
Installation torque is 5±0.5Nm

6. Removal of Front Hood Lock

6.1. Removal Steps

6.1.1. Turn and remove two screws off the front hood to take down its lock.

6.1.2. Remove the front hood lock cable off the front hood lock assembly.

6.2. Installation Steps

The installation steps are reverse to those for removal.

7. Removal & Adjustment of of Hood Cable

7.1. Removal & Adjustment of Steps
7.1.1. Remove the plastic nut behind the front hood handle in driver's cab.And you can also regulate the cable by adjusting this nut.

7.1.2. Use snipe nose pliers to remove the front hood cable off the pull cover.

7.1.3. Drag out the cable.

7.2. Installation Steps

The installation steps are reverse to those for removal.

II. Removal of Rear Trunk Cover

1. Preparations

Tools: flat head screwdriver, 13# sleeve, wrench and cross head screwdriver
Material(s): Clip

2. Removal of Rear Decoration Plate

2.1. Pry up the rear decoration plate with a flat head screwdriver before you take it apart.

2.2. Installation of Rear Decoration Plate
The installation steps are reverse to those for removal.

3. Removal and Installation of Trunk Lock

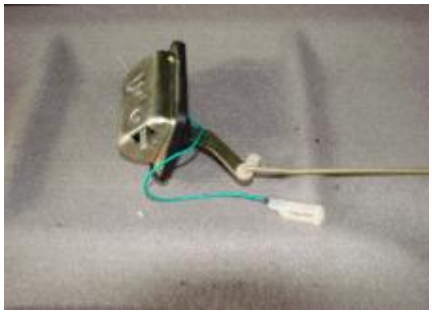
3.1. Removal Steps

3.1.1. Remove the pull rod off the upper lock.

3.1.2. Pull off the connector on top of the upper lock.

3.1.3. Use a cross head screwdriver to remove the three screws on the upper lock.

3.1.4. Remove the trunk lock.



3.2. Installation Steps

The installation steps are reverse to those for removal.
Installation notes: Is the lock column deformed? Is the riveting adequate? Is the lock jacket on the trunk in good condition? Or can the lock tongue open and shut freely?

4. Removal of Trunk Lock Cylinder

4.1. Removal Steps

4.1.1. Disengage the hitch bar from the lock core.

4.1.2. Pry open the clip on the lock core with a flat head screwdriver.

4.1.3. Push up the lock core to take it out.
Note: Do not throw away the washer of the lock core.

4.2. Installation Steps

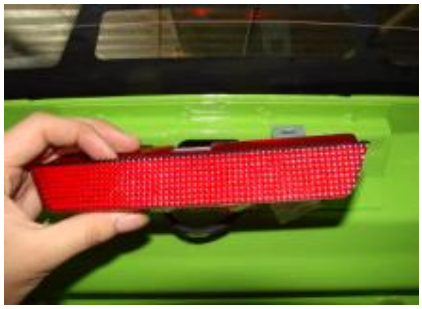
The installation steps are reverse to those for removal.
Pay attention to assemble it to its correct position and joint to door plate work.

5. Removal of Rear Wiper Nozzle

5.1. Removal Steps

5.1.1. Pry open the shield of the high mount ceiling light with a flat head screwdriver.

5.1.2. Pull off the connector, and then use a cross head screwdriver to remove the two screws on the high mount ceiling light and take it down.



5.1.3. Remove the two nuts on the spoiler with 10# sleeve.

5.1.4. Remove the spoiler.

5.1.5. Pull off the rear water nozzle (You can pry with a flat head screwdriver, but try to avoid any paint scratch), and then pull off the water nozzle hose.

5.2. Installation Steps

The installation steps are reverse to those for removal.
Note: Water injection opening should be opposite to wiper motor steering shaft.

6. Removal of Rear Wiper Motor

6.1. Removal Steps

6.1.1. Remove the rear wiper shield by hand.

6.1.2. Use a 10# sleeve wrench to loosen off the nut above the motor, and remove the rear wiper blade.
Installation torque is 12±2Nm

6.1.3. Remove the three fixing bolts on the rear wiper motor. Installation torque is 12±2Nm

6.1.4. Remove the motor.

6.2. Installation Steps

The installation steps are reverse to those for removal.

Chapter II Removal of Trims

I. Removal and Installation of Seat belts

1. Preparations

Tools: flat head screwdriver, wrench, sleeve wrench
Spare parts: disposable clip

2. Notes

Keep the seat belts clean and free of oil, and check them for any damage.

3. Removal Steps (Take Driver's Seat belt as an Example)

3.1. Carefully pry up the front sill plate with a flat head screwdriver.

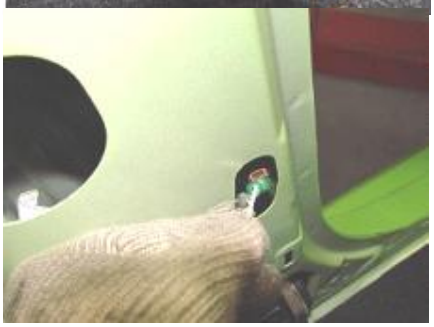
3.2. Remove the front door weather strip by hand.

3.3. Remove the B-pillar plate with a flat head screwdriver.

3.4. Remove the decorative covers at the upper and lower ends of the seat belt with a flat head screwdriver.

3.5. Use a 17# wrench to loosen the upper and lower fastening nuts before you remove the seat belt.
Installation Torque: 50±5Nm

3.6. Pull off the seat belt warning light connector by hand.



3.7. Use a cross head screwdriver to remove the pre-tension belt assembly.

4. Installation Steps

The installation steps are reverse to those for removal.
Note:
4.1. Keep the seat belt clean and free of oil, and check it for any damage.
4.2. The pillar shield should fit securely with the vehicle body without any looseness, and it should also fit well with the vehicle ceiling and weather strip s.
4.3. The seat belt adjusting slide baffle of the upper B-pillar shield should be able to move freely and won't affect the adjustment of the seat belt, and its fitting clearance with the lower shield should be consistent and less than 1mm;
4.4. The fitting clearance between the lower B-pillar shield and the front/rear sill plate should be consistent and less than 1mm;

II. Removal and Installation of Seats

Preparation of Tools: sleeve wrench

1. Removal of Front Seats

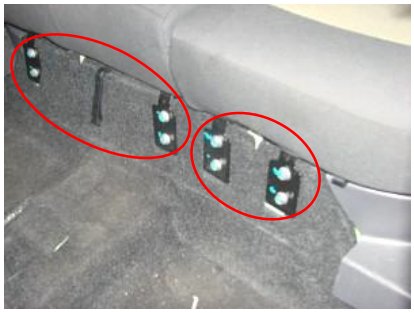
1.1. Move the seat by pulling at the movable handle below it, and when the fixing bolts are shown, use a 13# socket wrench to remove the bolts in the seat.
Torque: 25±3Nm

1.2. Pull off the seat connector and raise the seat.

2. Removal of Rear Seats

2.1. Use a 13# socket wrench to remove the fixing bolts in the rear seat cushion.
Torque: 25±3Nm

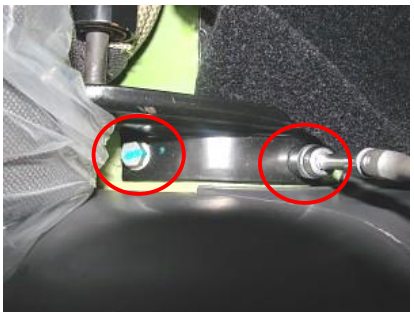
2.2. There are two rear seat cushions, a left one and a right one, secured by four bolts respectively.
Torque: 25±3Nm



2.3. The cushion can be dismounted when the four fixing bolts are removed.

2.4. Pull up the pull button in the rear seat and the seat back can be released forward (Take the left-rear seat as an example).

2.5. Use a 13# socket wrench to loosen off the two fixing bolts below the seat back (Take the left-rear seat as an example).
Torque: 25±3Nm



2.6. Open the trunk and take out the trunk vehicle carpet.

2.7. Loosen off the fixing seat of the spare tire and take it out.

2.8. Use a 13# socket wrench to loosen off the fixing bolts in the rear seat back, and then the rear seat back can be removed.
Torque: 25±3Nm

3. Installation Steps

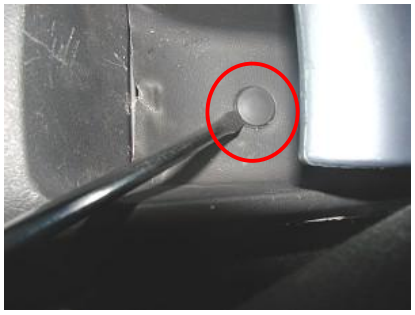
The installation steps are reverse to those for removal.

III. Removal and Installation of auxiliary Instrument Panel

Preparation of Tools: cross head screwdriver, flat head screwdriver

1. Removal Steps

1.1. Use a flat head screwdriver to pry open the shield at the hand brake and gears.



2.6. Open the trunk and take out the trunk vehiclepet.

2.7. Loosen off the fixing seat of the spare tire and take it out.

2.8. Use a 13# socket wrench to loosen off the fixing bolts in the rear seat back, and then the rear seat back can be removed.
Torque: 25±3Nm

3. Installation Steps

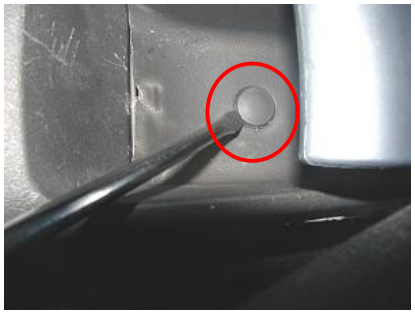
The installation steps are reverse to those for removal.

III. Removal of auxiliary Instrument Panel

Preparation of Tools: cross head screwdriver, flat head screwdriver

1. Removal Steps

1.1. Use a flat head screwdriver to pry open the shield at the hand brake and gears.



1.2. Use a cross head screwdriver to loosen off the fixing screws of the shield

1.3. Use a flat head screwdriver to pry open the shield at the hand brake and gears.
Note: Please pry carefully.

1.4. Use a cross head screwdriver to remove the two fixing screws below the shield.

1.5. Take out the gear selector shield upward by hand (The shield and the auxiliary Instrument Panel are fixed with clips and no fixing screws are used).

1.6. Use a cross head screwdriver to remove the front fixing screws of the auxiliary Instrument Panel (One on the left and the other one the right).

1.7. Use a cross head screwdriver to remove the rear fixing screws of the auxiliary Instrument Panel (One on the left and the other one the right), and then the suxiliary Instrument Panel can be dismounted.

2. Installation Steps

The installation steps are reverse to those for removal.

IV. Removal and Installation of Vehicle Carpet

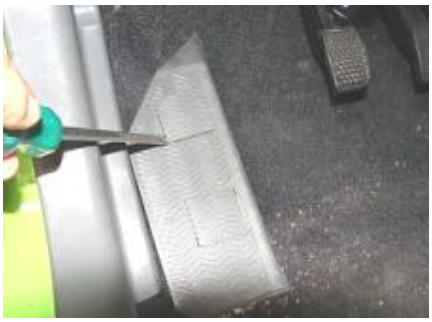
Tools: flat head screwdriver, cross head screwdriver; sleeve wrench

1. Removal Steps

1.1. Dismount the seats. (See Removal of Seat)
1.2. Disassemble the auxiliary Instrument Panel (See Removal of auxiliary Instrument Panel)
1.3. Remove the seat belt shield. (See Removal of Seat belt)
1.4. Remove the front/rear sill plates, B pillar and the lower shield.

1.5. Use a flat head screwdriver to pry up the top cover of footrest plate.

1.6. Use a 10# wrench to remove the footrest plate covers
Installation Torque: 7±1N.m



1.7. Remove the rear seat cushion (See Removal of Seats)
Use a cross head screwdriver to remove the left shield of the rear seat cushion.

1.8. Take down the vehicle vehicle carpet by hand.

2. Installation Steps

2.1. Put the vehicle vehicle carpet inside the vehicle, and take out the harness connected with the seats, and then press the vehicle vehicle carpet besideds the middle passage tightly.

2.2. Keep the seat holes visible.

2.3. Spread the vehicle vehicle carpet till it gets to the footrest plate and press it tightly.

2.4. Spread the left-rear part of the vehicle vehicle carpet according to the shape of the vehicle floor, keep the installation holes of the left-rear seats visible, and spread and press the rear part of the vehicle vehicle carpet according to the shape of the vehicle floor.

V. Removal of Damping Mat

1. Removal Steps

1.1. Remove the vehicle vehicle carpet (See Removal of Vehicle Vehicle carpet).

1.2. Take down each damping mat.

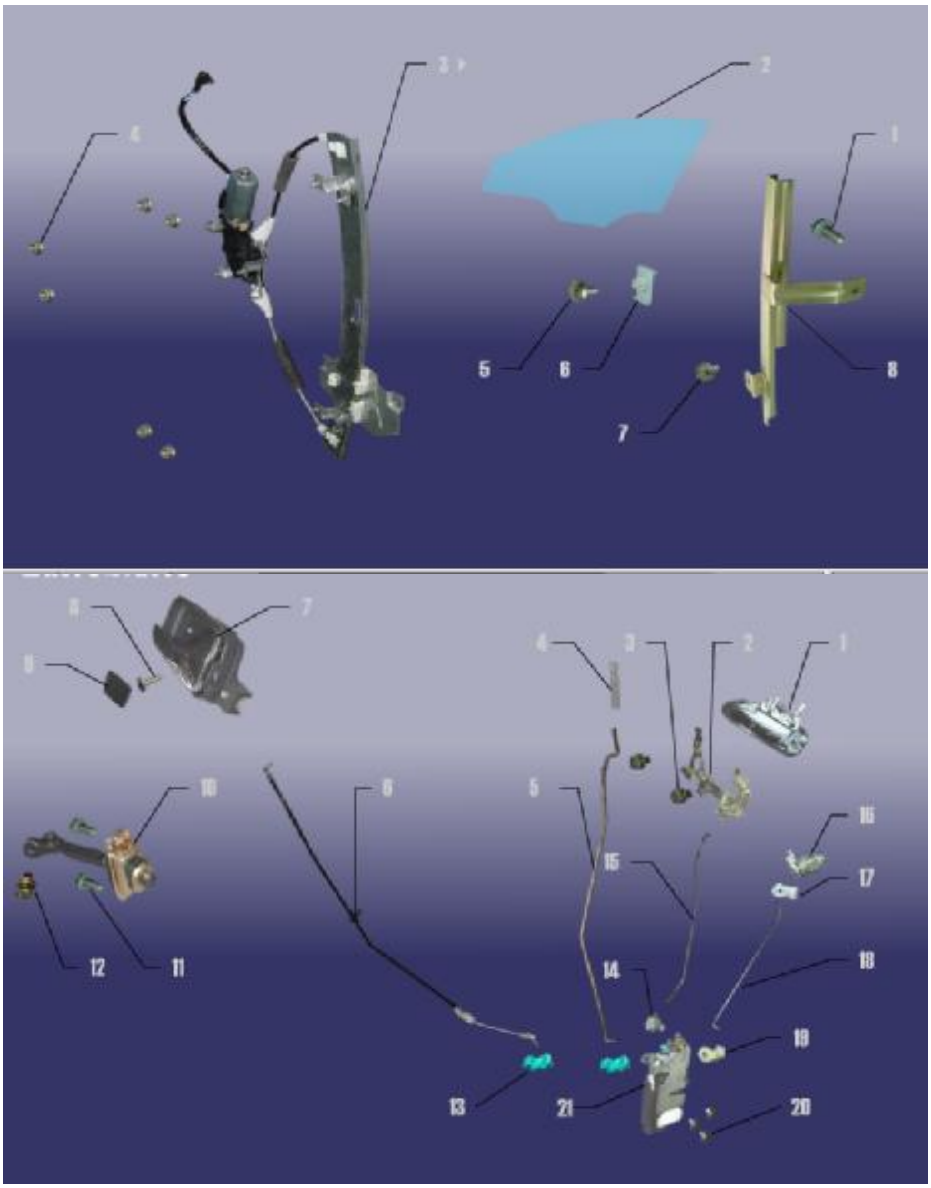
2. Installation Steps

2.1. The installation steps are reverse to those for removal.
2.2. Notes: When installing, sort out the harness, and at the same time the damping mat should fit well with the vehicle body plate work.

Chapter III Removal & Maintenance of Vehicle Doors

I. Removal, Installation & Maintenance of Front Doors

1. System Constitution Diagram



2. Preparations

Tools: flat head screwdriver, cross head screwdriver, 10#, 13# sleeve, wrench and pliers.

3. Notes

3.1. Please wear necessary labour protection supplies to avoid any accident.
3.2. Disconnect the battery to avoid damaging the eletrical equipment.
3.3 Use the correct method to disassemble and assemble the glass to avoid damage.

4. Removal Steps

4.1. Remove the left-front vehicle door weather strip. The fixing clip of the vehicle door weather strip are "-" shaped, and when disassembling it, press the weather strip downward, and then push the weather strip to one side till you can see part of the clip. And go on to push it to the opposite direction to show another part of it. Don't pull the weather strip vertically so as not to damage the weather strip.

4.2. Use a flat head screwdriver to pry up the plastic decorative block fixing the rearview mirror outside the vehicle door.

4.3. Use a 10# sleeve wrench to loosen off the two screws fixing the outside rearview mirror.

4.4. Pull off the electrically-adjustable outside rearview mirror harness connector and take off the outside rearview mirror assembly.

4.5. Use a cross head screwdriver to loosen off the four screws that fix the shield inside the door.

4.6. Use a cross head screwdriver to loosen off the screw that fixes the handle inside the vehicle door.

4.7. Use a flat head screwdriver to pry off the plastic cover of the screw hole for the handle inside the vehicle door, and then remove the fixing screw with a cross head screwdriver so as to disassemble the lock assembly inside the door.

4.8. Pull of the vehicle alarm connector.

4.9. Remove the shield inside the door.

4.10. Pull off the power window up-down switch connector.

4.11. Use a cross head screwdriver to loosen off the two screws of the front door handle fixing mount.

4.11. Tear off the anti-water plastic sheeting on the left-front door.

4.12. Connect the battery and plug in the window up-down switch plug, lower the window glass to a proper position and loosen off the two screws that fix the glass.

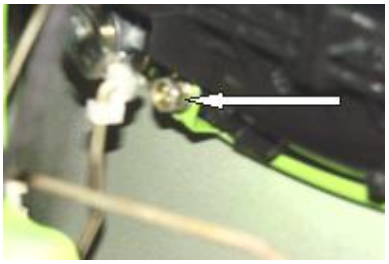
4.13. Take out the glass carefully.

4.14. Use a 10# sleeve to loosen off the five screws that fix the window glass up-down regulator.

4.15. Loosen off the screws, and then pull off the window glass up-down motor connector to take out the window glass up-down regulator assembly.

4.16. Use a 10# sleeve wrench to loosen off the two fixing screws and remove the lock outside the door.

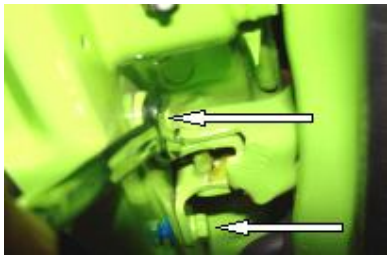
4.17. Use a cross head screwdriver to loosen off the three screws fixing the lock core and remove it.

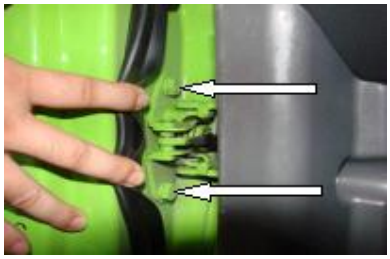


4.18. Use a 13# sleeve wrench to loosen off the four fixing screws at the hinge that fixes the vehicle door, and then the vehicle door can be disassembled.

5. Installation Steps

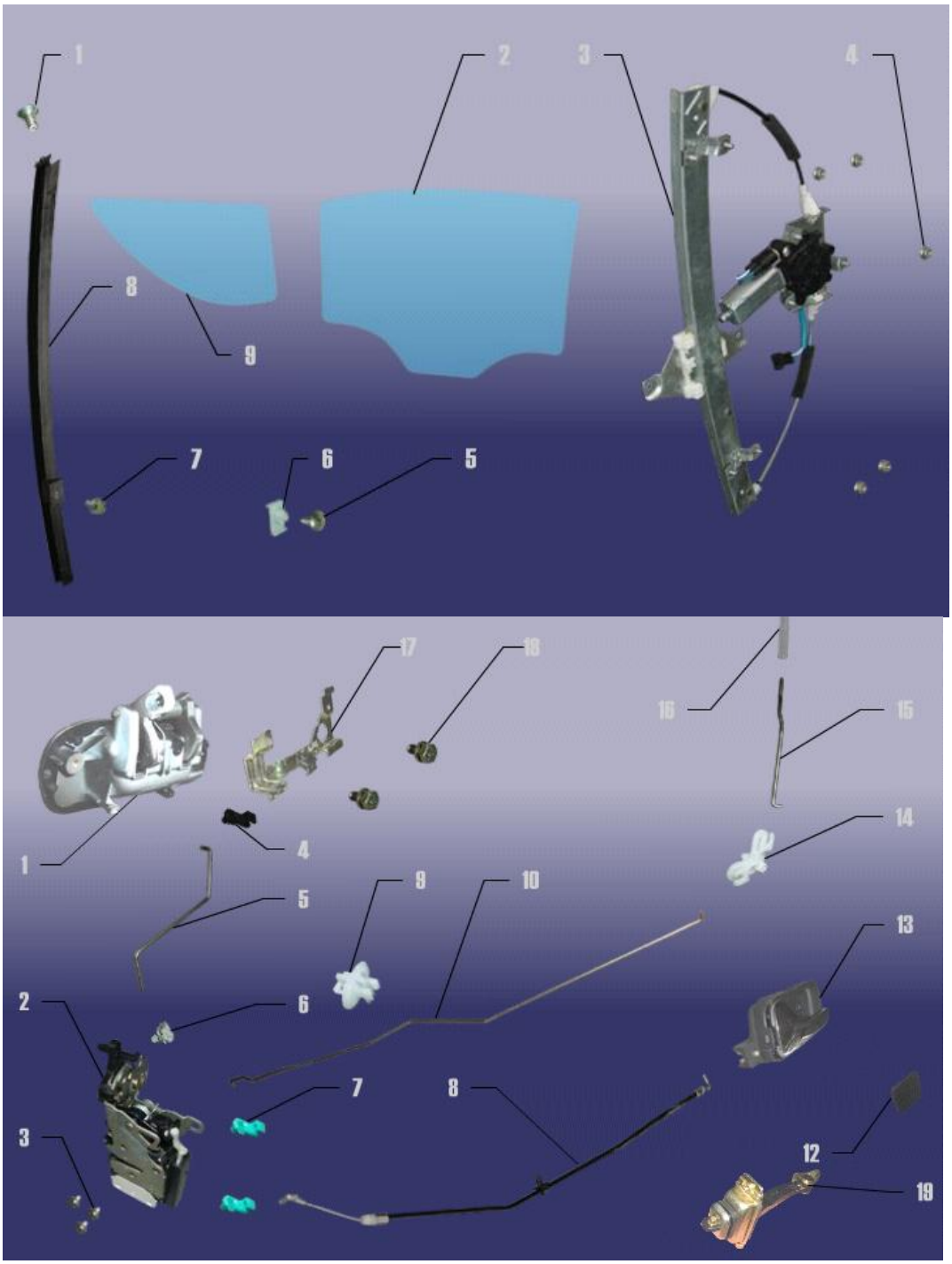
The installation steps are reverse to those for removal.
Note: The removal steps for the right-front door are the same as those for the left-front door.





II. Removal & Installation of Rear Doors

1. System Constitution Diagram



2. Preparations

Tools: flat head screwdriver, cross head screwdriver, and 10# / 13# sleeve, wrench.

3. Notes

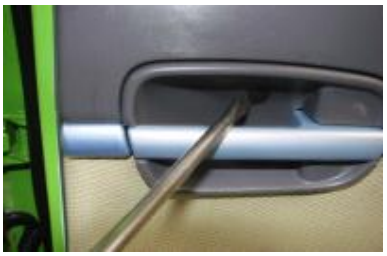
3.1. Please wear necessary labor protection supplies to avoid accidents.
3.2. Disconnect the battery so as to avoid damaging the eletrical equipment.
3.3. Take correct steps during removal and installation of glass to avoid any damage.

4. Removal Steps

4.1. Disassemble the right-rear door weather strip. The fixing clip of the vehicle door weather strip are "-" shaped, and when disassembling it, press the weather strip downward, and then push the weather strip to one side till you can see part of the clip. And go on to push it to the opposite direction till another corner of it is exposed. Don't pull the weather strip vertically so as not to damage the weather strip.

4.2. Use a cross head screwdriver to loosen off the four screws that fix the shield inside the door.

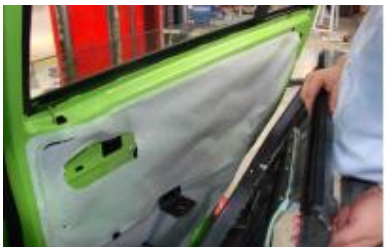
4.3. Use a flat head screwdriver to pry off the plastic cover of the screws that fix the handle inside the vehicle door.



4.4. Use a cross head screwdriver to loosen off the screws that secure the handle inside the door, and then disassemble it.

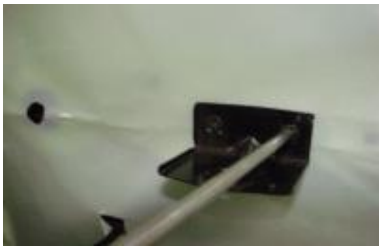
4.5. Use a cross head screwdriver to loosen off the screws that secure the handle inside the vehicle door, and then disassemble the handle inside the door.

4.6. Disassemble the shield inside the door by hand.



4.7. Pull off the power window up-down switch connector.

4.8. Use a cross head screwdriver to remove the two fixing screws in the mount that fixes the rear door handle cover.

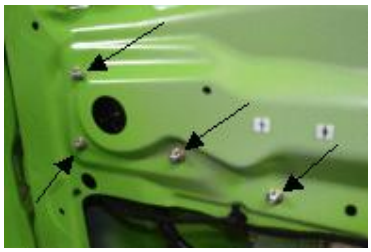


4.9. Tear off the anti-water plastic sheeting on the rear door.

4.10. Connect the battery, lower the window glass to a proper position and loosen off the two screws that fix the glass, and then carefully diassemble the glass.

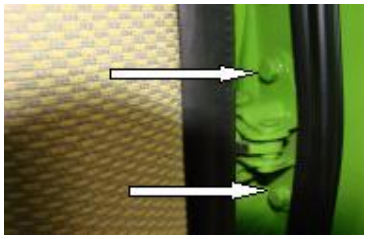
4.11. Use a 10# wrench to loosen off the five screws that fix the window up-down regulator and remove it.

4.12. Use a 10# sleeve wrench to loosen off the screw that fix the handle outside the rear door and then remove it.



4.13. Use a cross head screwdriver to loosen off the three screws that fix the rear door lock core and then remove it.

4.14. Use a 13# sleeve wrench to loosen off the four screws (at the hinge) that fix the right-rear vehicle door and then remove it.



5. Installation Steps

The installation steps are reverse to those for removal.
Note: Removal of the left-rear door is similar to that of the right-rear door.

Chapter IV Removal, Installation & Maintenance of Front/Rear Bumper

I. Removal, Installation & Maintenance of Front Bumper

1. Preparations

Tools: 8# wrench, 8#sleeve, cross head screwdriver, flat head screwdriver
Spare parts: disposable clips

2. Notes

2.1. Please wear necessary labor protection supplies to avoid accidents.
2.2. Try to avoid scratching the painted surface of the bumper during the removal operation.
2.3. For removal in colder environment, operate gently to avoid damaging the bumper.

3. Removal Steps

(Take the left side as an example)
3.1 Open the Front Hood.
3.2 Remove the headlights. (See Removal and Installation of Headlights)
3.3 Use a cross head screwdriver to loosen off the four screws on the grid fence.

3.4. Use a 8# sleeve wrench to loosen off the two bolts on the bumper and the left wing sheet.
Torque: 11N • m

3.5. Use a cross head screwdriver to loosen off the 7 screws on the bumper and the front compartment member.

3.6. Use a 8# sleeve wrench and a cross head screwdriver to loosen off the screws and fixing screws below the mud fender and the bumper.
Installation Torque: 2±0.5 Nm

3.7 Raise the vehicle with a hoister.
3.8. Use a cross head screwdriver and 8#sleeve to loosen off the fixing bolts and the screws below the mud fenderand the bumper.
Installation Torque: 2±0.5N.m

3.9. Pull off the fog lights connector.

3.10. Remove the bumper.

4. Installation Steps

The installation steps are reverse to those for removal.

II. Removal, Installation & Maintenance of Rear Bumper

1. Preparations

Tools: cross head screwdriver, flat head screwdriver, No.8 sleeve.
Spare parts: disposable clips.

2. Notes

2.1. Please wear necessary labor protection supplies to avoid accidents.
2.2. Try to avoid scratching the painted surface of the bumper when removing it.
2.3. When removing the bumper in colder environment, operate gently to avoid damaging it.

3. Removal Steps

3.1 Disassemble the tail lights. (See Removal and Installation of Tail Lights)
3.2. Open the trunk cover, and use a cross head screwdriver to loosen off the four fixing clips on the rear bumper.

3.3. Use a cross head screwdriver to loosen off the three clips fixing the rear bumper bottom and the vehicle body.
Note: Raise the vehicle with a hoister.

3.4 Use an 8# torque wrench to loosen the screws connecting the wing sheet and the bumper.
Note: Two fixing screws on either side.

3.5 Pull off the connector of the rear license plate lights.

3.6 Disassemble the connector of the reverse radar and remove the rear bumper assembly.

3.7 Unplug the reverse radar.

3.8 Use a cross head screwdriver to loosen the clip seat of the reverse radar.

4. Installation Steps

The installation steps are reverse to those for removal.

Chapter V Removal and Installation of Headlights, Fog Lights & Tail Lights

1. Preparations

Tools: 10# open-ended wrench, cross head screwdriver.

2. Notes

2.1. Please wear necessary labour protection supplies to avoid any accidents.
2.2. Try to avoid scratching the painted surface of the bumper when removing it.
2.3. When removing the bumper in colder environment, operate gently to avoid cracking it.
2.4. When disassembling the headlights, violent operation may damage their clips on the bumper, so operate properly.
2.5 Pay attention not to scratch the headlight surface when disassembling and placing it.

3. Removal Steps of Headlights

3.1. First open the front hood.

3.2. Use a 10# open-ended wrench to loosen off the three fixing screws of the right headlights on the front compartment member.

3.3. Hold the headlight with both hands and apply a forward force to loosen off the right headlights.

3.4. Unplug the right headlights harness to take out the right headlights assembly.

3.5. Turn open the the high beam headlight holder shield by hand.

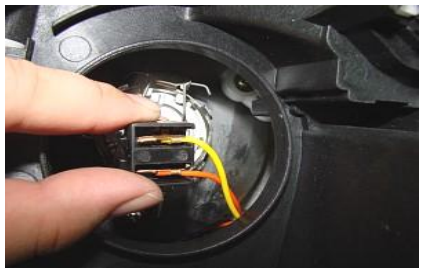
3.6. Press down the bulb fixing clip by hand and turn the clip over to take out the bulb.

3.7. Unplug the right-front position light harness to take out the bump.

3.8. Turn open the low beam light holder shield by hand.

3.9. Unplug the low beam light harness.

3.10. Press down the bulb fixing clip by hand and turn the clip over to take out the bulb.



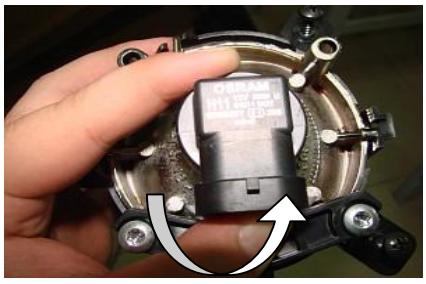
3.11. Turn the right-front turning light shield counterclockwise to disassemble the bulb.
(See the above steps for removal of the left headlight)

4. Removal of Front Fog Lights

4.1. Diassemble the bumper assembly. (Refer to removal of bumper)
4.2. Unplug the right-front fog lights harness connector.

4.3. Use a cross head screwdriver to loosen off the three screws that fix the front fog light, and then disassemble the right-front fog light assembly

4.4. Turn the right-front fog light holder and remove the bulb.
(See the above steps for removal of left-front fog lights)



5. Removal of Tail Lights

5.1. Open the rear door.
5.2. Use a cross head screwdriver to loosen off the screws fixing the left tail light.

5.3. Remove the left tail light, unplug the left tail light harness connector, and then disassemble the left tail light assembly.

5.4. Use a cross head screwdriver to loosen off the four screws that fix the tail light holder and open it.

5.5. Turn the bulb counterclockwise by hand and then the bulb can be removed.

6. Removal of License Plate Lights

6.1. Use a flat head screwdriver to pry off the license plate light.

6.2. Unplug the harness plug to disassemble the license plate light.

7. Installation & Adjustment of Headlights

7.1. Installation Steps for the Headlights

The installation steps of headlights are reverse to those for removal.

7.2. Functions of Headlights

7.2.1. Front view

See right figure:

1 High beam light
2 Position light
3 Low beam light
4 Turn light

7.2.2. Back view

1 High beam light holder
2 High beam adjusting nut
3 Low beam light holder
4 Low beam adjusting nut
5 High beam, low beam, position and turning light plugs
6 Turning light holder

8.3. Adjustment of Headlights

8.3.1 Pay attention to law and regulations and verify the following items before adjustment:

1). The tire air pressure should comply with the related standard;

2). Vehicle is unloaded (except for spare tire and equiping tools, and include driver's weight for sedan);

3). The vehicle should be parked on level and smooth road or field;

4). The matched mirror surface of the headlight should be fresh of dirt;

5). The power supply should work normally and the bulb should be properly installed.

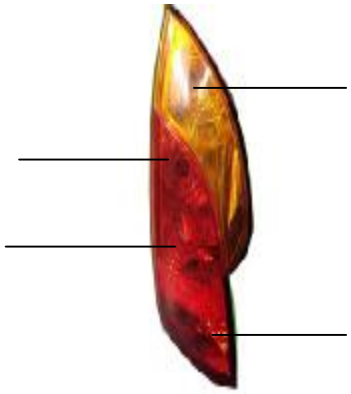
8.3.2. Insert a cross head screwdriver into related adjusting hole to adjust the light.

8. Installation & Adjustment of Front Fog Lights

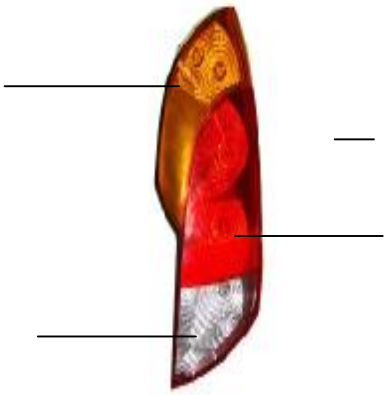
8.1. The installation of front light
The installation steps of front fog light are reverse to those for removal.
8.2. The adjustment of the front fog lights
The front fog lights can be adjusted by turning the device with your hand or a cross head screwdriver.

9. Installation of Tail Lights

9.1. Installation steps of the tail lights
The installation steps of tail lights are reverse to those for removal.
9.2. The functions of the tail lights
9.2.1. Front view
See right figure:
1). Left-rear turning light (21w)
2). Brake light (21w)
3). Position light (5-21w)
4). Rear Fog Light (21w)



See right figure:
1). Right-rear turning light (21w)
2). Brake light (21w)
3). Position light (5-21w)
4). Reverse indicator (21w)



Chapter VI Removal and Installtion of Vehicle Ceiling

1. Preparations

Tools: sleeve wrench, cross head screwdriver, flat head screwdriver

2. Notes

2.1. During the removal and installtion, make sure to apply proper force and no violent operation is allowed.

2.2. During removal and installation of the inner decoration parts, make sure to protect the decoration parts from being scratched.

3. Removal and Installation of Sun Visor

3.1. Removal Steps

3.1.1. Use a cross head screwdriver to loosen off the screws in the sun visor on the left of the driver's cab, and disassemble the sun visor.
As shown in the figure:
Torque: 3±1Nm

3.1.2. The removal steps for the right sun visor are reverse to those for removal of the left one.

3.2. Installation Steps

The installation steps are reverse to those for removal.

4. Removal and Installation of Vehicle-top Armrest

4.1. Removal Steps

4.1.1. Open the ceiling armrest screw cover over the co-driver's seat by hand, and then use a cross head screwdriver to loosen off the left and right fixing screws.
As shown in the figure:
Torque: 9±3Nm

4.1.2. Remove the ceiling armrest.

4.1.3. The removal of other ceiling armrests can follow the above steps.

4.2. Installation Steps

The installation steps are reverse to those for removal.

5. Removal and Installation of Front Ceiling light

5.1. Removal Steps

5.1.1. Align a flat head screwdriver with the groove along the ceiling light edge to pry it open, as shown in the figure:
Note: Do not scratch part surface.

5.1.2. Remove the three fixing screws of the the front ceiling light.
Torque: 1.5±0.5Nm

5.1.3. Unplug the harness and disassemble the front ceiling light assembly.

5.2. Installation Steps

The installation steps are reverse to those for removal.

6. Removal and Installation of Reverse Radar Display

6.1. Removal Steps

6.1.1. Use a cross head screwdriver to loosen off the screws of the reverse radar display.

6.1.2. Unplug the harness and remove the reverse radar display.

6.2. Installation Steps

The installation steps are reverse to those for removal.

7. Removal and Installation of A-pillar Shield

7.1. Removal Steps

7.1.1. Use a flat head screwdriver to pry open the weather strip of the left A-pillar shield, and then take out the left A-pillar shield by hand.

7.1.2. Take out the left A-pillar shield.

7.1.3. Follow the the removal steps of the right A-pillar shield for that of the left one.

7.2. Installation Steps

The installation steps are reverse to those for removal.

8. Removal and Installation of B-pillar Shield

8.1. Removal Steps

8.1.1. Disassemble the shield below the left B-pillar (See Removal and Installation of Seat belt).

8.1.2. Use a flat head screwdriver to pry open the B-pillar shield.
Note: protect the trim part surface from scratching.

8.1.3. Follow the removal steps of the left B-pillar shield for removal of the right B-pillar shield.

8.2. Installation Steps

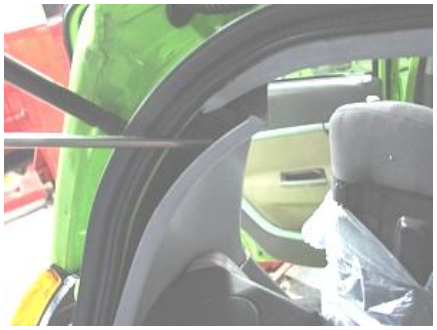
The installation steps are reverse to those for removal.

9. Removal and Installation of C-pillar Shield

9.1. Removal Steps

9.1.1. Use a sleeve wrench to loosen off the seat belt bolts (See Removal and Installation of Rear Seats & Seat belts).

9.1.2. Use a flat head screwdriver to pry open the C-pillar upper shield.



9.1.3. Remove the C-pillar upper shield.

9.1.4. Please follow the removal steps of left C-pillar upper shield for that of the right C-pillar upper shield.

9.2. Installation Steps

The installation steps are reverse to those for removal.

10. Removal and Installation of Vehicle Ceiling

10.1. Removal Steps

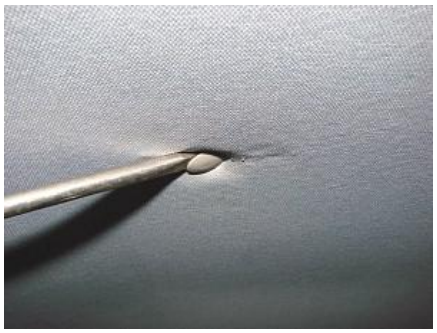
10.1.1. Disassembling the left/right front sun visors. (See Removal and Installation of Sun Visor)

10.1.2. Disaasembling the front ceiling light. (Refer to removal and installation of front ceiling light)

10.1.3. Disassembling all interior ceiling armrests. (See removal and installation of ceiling armrest)

10.1.4. Disassembling A/B/C-pillar shield. (See removal and installation of A/B/C-Pillar Shield)

10.1.5. Use a flat head screwdriver to loosen off the vehicle ceiling clip (4 in all).



10.1.6. Disassemble the four doors' weather strip by hand.

10.1.7. Open the trunk and disassemble the vehicle ceiling.

10.2. Installation Steps

The installation steps are reverse to those for removal.

Chapter VII Removal and Installation of Instrument Panel & Instrument Panel Crossbeam

I. Removal of Instrument Panel

Tools: 8 #sleeve, extension bar, 飞扳[MS1], cross head screwdriver, flat head screwdriver, etc.

1. Removal Steps

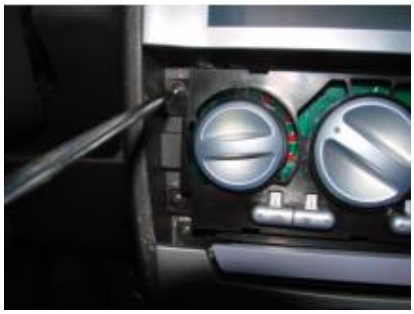
1.1. Open the storage box over the console, and use a cross head screwdriver to loosen off the two screws. Then use a flat head screwdriver to pry open the storage box. See the right figure:

1.2. Use a cross head screwdriver to loosen off the two screws than connect the emergency switch with the Instrument Panel, as shown in the figure:

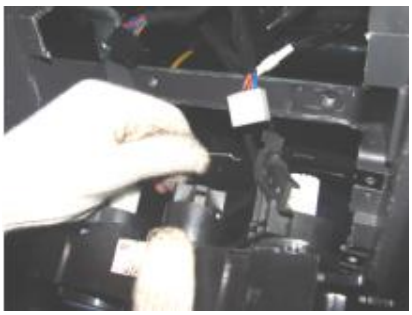
1.3. Pull out the top part by hand, and then use a flat head screwdriver to pry open the lower part. Unplug the harness when removing it, as shown in the figure:

1.4. Use a flat head screwdriver to pry open the control panel of the airconditioner switch and take it out.

1.5. Use a cross head screwdriver to loosen off the four screws that connect the airconditioner switch and the Instrument Panel.



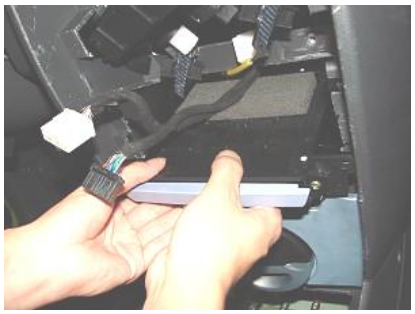
1.6. When taking the airconditioner switch, unplug the two harness plugs behind it and disassemble the two cables behind the switch.



1.7. Use a 8# sleeve wrench to loosen off the four fixing bolts that connect the audio system with the Instrument Panel.

1.8. When taking out the audio system, unplug the antenna and harness.

1.9. Use a cross head screwdriver to loosen off the two screws that connect the cup-holder and the Instrument Panel, and then take out the cup-holder.



1.10. Disassemble the auxiliary Instrument Panel (See Chapter I Removal, Installation & Adjustment of of the Brake System).

1.11. Use a cross head screwdriver to pry open the decoration sheet on the ash tray and take it out.

1.12. Use a cross head screwdriver to loosen off the four screws that connect the cigarette lighter with the Instrument Panel, and unplug the harness when removing the lighter.

1.13. Use a cross head screwdriver to loosen off the three screws that connects the ashtray with the Instrument Panel and take out the ashtray.

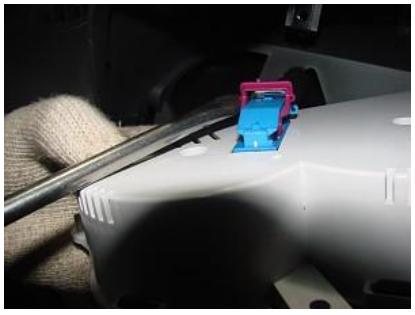
Note: When disassembling the console, the operations should be carried out from top to bottom, and you should disassemble the air-conditioner switch before disassembling the audio system.

1.14. Disassemble the steering wheel, combination switches and ignition switch.

1.15. Use a cross head screwdriver to loosen off the two screws on the instrument panel shield and the Instrument Panel, and then pull it out with both hands.

1.16. Use a cross head screwdriver to loosen off the four screws on the instrument panel and the Instrument Panel.

1.17. Use a flat head screwdriver to pry up the red clip and the instrument panel harness plug can be taken out before the instrument panel is taken out.



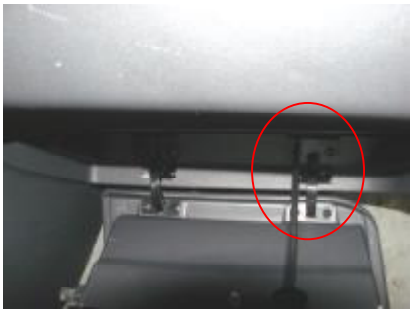
1.18. Push out the two harness plugs from behind the fog light switch.

1.19. Disassemble the left-front and the right-front door seal strip.

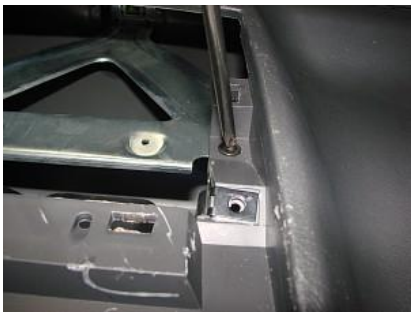
1.20. Disassemble the decorative shields of the left and righte A-pillars (See Removal of Vehicle Ceiling for details).

1.21. Open the storage box to the lower right of the Instrument Panel, use a cross head screwdriver to loosen off the four screws on the storage box and disassemble the storage box.

1.22. Disassemble the front hood cord switch (See Removal of Front Hood & Trunk).



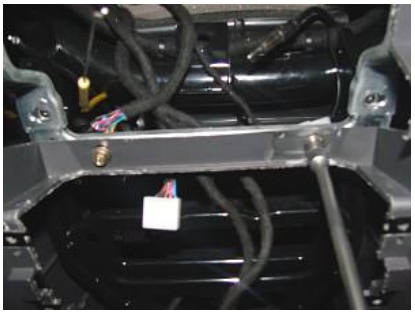
1.23. Use a cross head screwdriver to loosen off the two screws on the console.

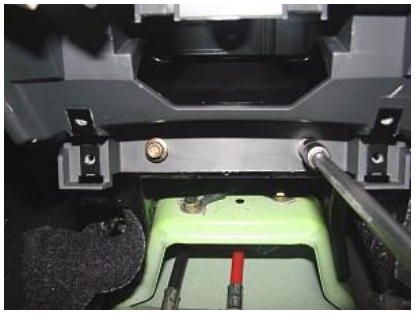


1.24. Pull off the central switch box shield to the left Instrument Panel.

1.25. Use a 8# wrench to disassemble the bolts to the left and right of the Instrument Panel (with 3 bolts for the top/middle/bottom part respectively, i.e. 9 in total).

1.26. Use a 8# sleeve wrench to loosen off the four bolts that connect the console and the instrument beam and another bolt behind the instrument panel.





1.27. Unplug the harness plugs of the left and right loudspeakers.

1.28. Take out the Instrument Panel.

Notes: 1. Disconnect the battery negative before disassembling the electrical equipment.
2. Don't wait until all the Instrument Panel bolts are disassembled before you disassemble the ones on the other side, or the Instrument Panel are likely to get deformed.

2. Installation Steps

2.1. The installation steps are reverse to those for removal.

2.2. Notes
①. Double-wind channels should agree with the air-conditioner outlet connector and be installed properly without any air leak, and the Instrument Panel air channel should not conflict with the Instrument Panel crossbeam, the evaporator and other parts, or the Instrument Panel and its accessories will not be installed properly.
②. The Instrument Panel should not interfer with the front windscreen or affect its installation and an even clearance should exist between the Instrument Panel and the windscreen.
③. The clearances between the Instrument Panel and either sides of the vehicle body should be consistant and meet the requirements for assembling the door weather strips.

3. Methods for Clearing Instrument Maintenance Indicator

1. Clearing with diagnosis equipment:
①. Using the X431 diagnosis equipment: Select the OBD-Ⅱ diagnosis connector and connect it with the diagnosis interface below the instrument panel; turn on the ignition switch and start the diagnosis equipment; choose the latest edition and select the instrument panel system; select "ATECH Instrument System", and then "Action Testing"; select "Maintenance and service requirements", and then click “confirm” to clear the instrument maintenance indicator, and then exit the diagnosis equipment;
②. Using K81/K61 diagnosis equipment: Select the MITSUBISHI diagnosis connector and connect it with the diagnosis interface below the instrument panel; turn on the ignition switch and start the diagnosis equipment; choose the latest edition and select the instrument panel system; select "Instrument System (ATECH)", and then "Action Testing"; select "To clear maintenance requirement indicator", and then press “enter” to clear the instrument maintenance indicator, and then exit the diagnosis equipment;
2. Clearing by the adjusting knob as follows:
①. Insert the key into the ignition switch and get it to the position “Ⅰ”;
②. Press the mode adjusting knob by hand and let it stay there when you turn the key to “Ⅱ” position;
③. Push down the mode adjusting knob and keep it there for about 20 seconds before you release the knob, and then the maintenance indicator will be cleared.

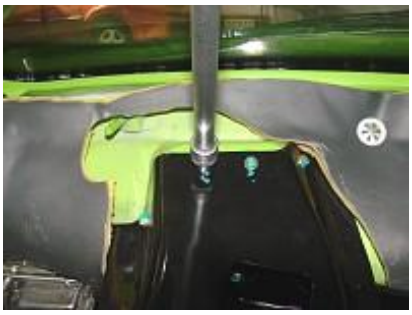
II. Removal of Instrument Panel crossbeam

1. Removal Steps

1.1. Disassemble the Instrument Panel assembly (See Removal of Instrument Panel)
1.2. Use a 13# sleeve, combined wrench to loosen off the two nuts and four bolts that connect the Instrument Panel crossbeam with the left/right A-pillars.

1.3. Use a 13# wrench to loosen off the bolts at the place as shown in the figure.

1.4. Use a 10# wrench to loosen off the four bolts at the places as shown in the figure.



1.5. Use a 10# wrench to loosen off the four bolts at the places as shown in the figure.

1.6. Use a 10# wrench to disassemble the two bolts of the ground wire earth at the places as shown in the figure.

1.7. Loosen off the single bolt and four nuts on the side pillars (See Chassis Maintenance Manual: side pillars), and then relase the side pillar.

1.8. Disassemble all harness plugs that are connected with the Instrument Panel crossbeam. For example, the harness plug of the brake light switch.

1.9. Take out the Instrument Panel crossbeam.

2. Installation Steps

The installation steps are reverse to those for removal.

Chapter VIII Air Conditioning System

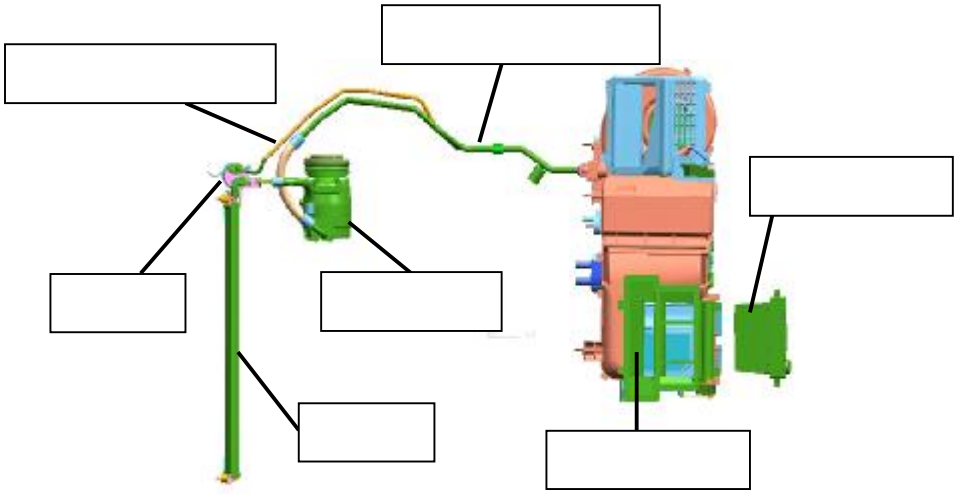
I. System Constitution

Air adjustment and distributing system: HVAC air mixing and distributor part, inside/outside circulation air inlet, air outlet, outside circulation air filter.

Control system: control panel assembly, micro motor, blower, speed regulating mode, high/low voltage switch, AC thermostat.

Heating system: heating water tank, hot water pipe, and engine cooling water system.

Cooling system: compressor, condenser, reservoir dryer, expansion valve, evaporator and pipe.



II. Removal of Evaporator Assembly

1. Preparations

Tools: cross head screwdriver, vehiclep pliers, socket spanner
Auxiliary material: refrigerant, antifreeze, sponge rubber strip

2. Removal Steps

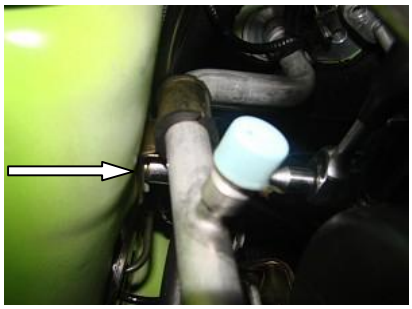
2.1. Use coolant recycling machine to recycle the coolant.
Note:

（1） Don’t deal with the coolant in any closed place or near flame.

（2） Do not splash the refrigerant into eyes and skin.

2.2. Disassemble the Instrument Panel assembly and the front crossbeam, and unplug the related electrical equipment connector. (See Removal and Installation of Instrument Panel)

2.3. Use a sleeve wrench to loosen off the fixing bolts of the high/low pressure pipes.



2.4. Loosen the fastening nuts of the high/low pressure pipes, and then pull them out.

2.5. Loosen off the three nuts fixed on the plate work.

2.6. Use pliers to remove the inlet/outlet water pipes of the evaporator and pull out the pipes.
Note: Coolant will flow out from the water pipe, pay attention to recycle the coolant.

2.7. Loosen off the 8 fixing nuts that fix the evaporator assembly on the plate work from the front compartment (See the following figures for detailed positions).

2.8. Take the evaporator assembly from the driver's cab..

3. Installation of Evaporator Assembly

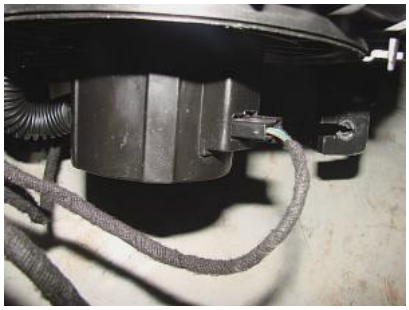
The installation steps are reverse to those for removal.

4. Removal and Installation of Evaporator Interior

Preparation of Tools: cross head screwdriver, sleeve wrench.

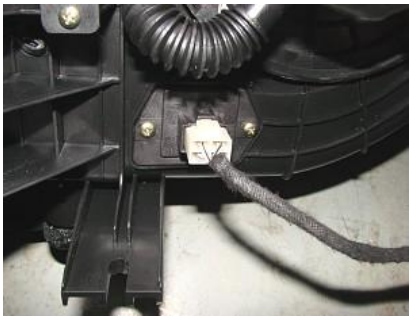
1. Replacement of Blower

1.1. Removal Steps
1.1.1. Disassemble the blower motor, relay and motor speed regulation module plug.

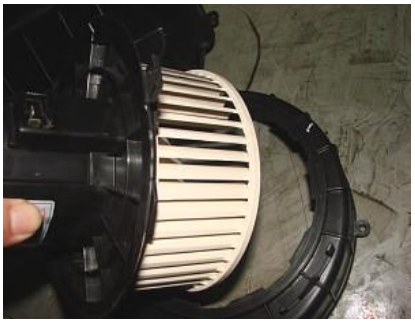


1.1.2. Remove the blower cooling jacket.

1.1.3. Push down the clip and drag out the blower clockwise.

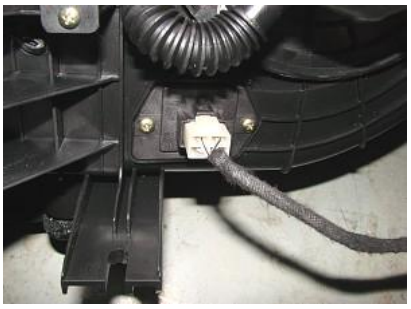


1.2. Installation Steps
The installation steps are reverse to those for removal.



2. Removal and Installation of Blower Speed Regulation Module

2.1. Removal Steps
2.1.1. Pull out the speed regulation module plug.



2.1.2. Use a cross head screwdriver to loosen off the 2 fixing screws on Speed Regulation Module.

2.1.3. Pull out the speed regulation module.

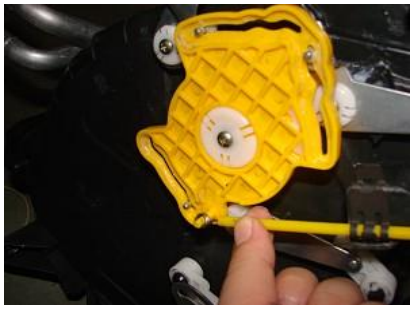
2.2. Installation Steps
The installation steps are reverse to those for removal.

3. Removal and Installation of Heater Exchanger

3.1. Removal Steps
3.1.1. Disassemble the evaporator assembly. (See Removal of Evaporator Assembly)
3.1.2. Disassemble the air-conditioner harness. (See Removal of Air-conditioner Harness)
3.1.3. Loosen off the two fixing screws and remove the heater exchanger shield.

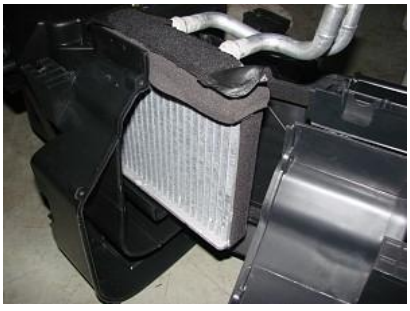
3.1.4. Unplug the plug of the evaporator thermostat.

3.1.5. Disassemble the mode throttle hitch bar.



3.1.6. Remove the temperature control throttle bar.

3.1.7. Loosen off the 8 screws on the heater shiled, and disassemble the evaporator shield.
Notes: The sponge weather strips around the shield are for single use only.



3.1.8. Use a flat head screwdriver to pry off the clips that fix the air conditioner cover plate assembly.

3.1.9. Remove the air conditioner cover plate assembly.

3.1.10. Tear open the sponge around the inlet/outlet water pipes and remove the fixing clips.

3.1.11. Remove the heater exchanger.

3.2. Installation Steps

The installation steps are reverse to those for removal.

After the installation, the system should be evacuated, proper pressure should be maintained and anti-freeze agent should be filled to check for any leakage. Check if the radiator is blocked and pressure air can be used to get it through if it is.

4. Removal and Installation of Mode Throttle Related Mechanism

4.1. Removal of Steps

4.1.1. Remove the mode throttle hitch bar, use a cross head screwdriver to lossen off the fixing screws on the control panel to disassemble.

4.1.2. Loosen off the three screws and washers behind the control panel that control defroster, blowing head, blowing foot and control arm.

4.2. Installation Steps
The installation steps are reverse to those for removal.

5. Removal and Installation of Blend Throttle Related Mechanism

5.1. Removal Steps
5.1.1. Remove the blend throttle bar, and use a cross head screwdriver to loosen off the screws on the control panel.

5.1.2. Use a flat head screwdriver to pry off the control arm.

5.1.3. Remove the blend throttle.

5.2. Installation Steps
The installation steps are reverse to those for removal.

6. Removal and Installation of Int./Ext. Throttle Motor & Related Mechanism

6.1. Removal Steps
6.1.1. Unplug the motor plug.

6.1.2. Loosen off the 4 fixing screws to remove the shield.

6.1.3 Loosen 3 screws of inside/outside circulation ventilator motor, and disassemble the motor.

6.1.4. Use a flat head screwdriver to pry off the plastic parts that fix the inside/outside circulation ventilator.

6.1.5 Remove the inside/outside circulation ventilator.
6.2. Installation Steps
The installation steps are reverse to those for removal.

7. Removal and Installation of Evaporator

7.1. Removal Steps
7.1.1. Disassemble the evaporator assembly (See removal of Eevaporator assembly)

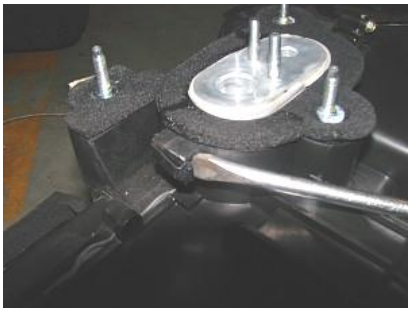
7.1.2. Remove the air-conditioner harness (See removal of air-conditioner harness)

7.1.3 Disassemble evaporator water thermostat (Refer to removal of evaporator water thermostat)

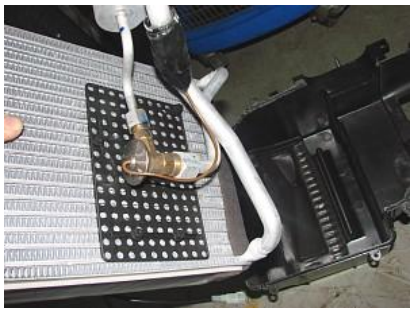
7.1.4 Disassemble mode ventilator connection rod (Refer to removal of mode ventilator motor)

7.1.5. Remove the temperature control throttle bar

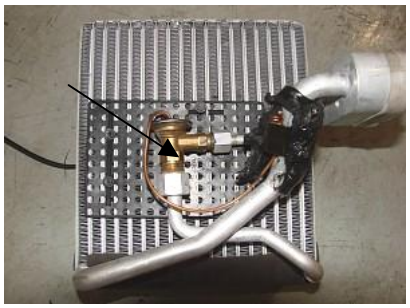
7.1.6. Loosen off the 9 screws on the evaporator shield, and use a flat head screwdriver to pry off the two clips to disassemble the evaporator shield.
Note: The sponge seal around housing is for single use only



7.1.7 Remove the evaporator assembly.



7.1.8. Use a wrench to disassemble the expansion valve.
7.2. Installation of the Evaporator Assembly
The installation steps are reverse to those for removal.
After the installation, the system should be evacuated, proper pressure should be maintained and anti-freeze agent should be filled to check for any leakage. Check if the radiator is blocked and pressure air can be used to get it through if it is.



III. Trouble Shooting

Types of pressure deviation	Possible causes	Method for troubleshooting
1. The pressure at the high pressure side remains unchanged or just slightly rises (compared with the value when the engine stalls); the pressure at the low pressure side is within or under the range as shown; the air conditioner is under refrigeration. 2. The pressure at the high pressure side is normal; the pressure at the low pressure side is within the range as shown; the air conditioner is under refrigeration.	Lack of refrigerant or the expansion valve fails	Evacuate the refrigerant ●If the volume of the refrigerant is normal 1. Replace the expansion valve 2. Refill the refrigerant to the system 3. Test the pressure again ●If the volume of the refrigerant is short 1. Check if there is leaking, if there is fix it 2. Refill the refrigerant to the system 3. Test the pressure again
The pressure at the high pressure side is higher than the specified value; the pressure at the low pressure side falls rapidly to within or under the range as shown; the air conditioner is under refrigeration.	The blockage or throttling occur somewhere in the refrigerant pipelines The expansion valve fails	Touch the pipelines to feel the temperature change ●If there exists temperature differences on several parts of a certain component 1. Dredge the pipe with compressed air and nitrogen and replace the expansion valve. 2. Replace the blocked parts. ●If no trouble found: 1. Dredge the pipelines with compressed air and nitrogen 2. Test the pressure again.
Initially, the pressures at the high and low pressure sides are normal, but after a period of time, the pressure at the high pressure side is higher than the specified value and the pressure at the low pressure side is within or under the range as shown; the air conditioner is under refrigeration.	The expansion valve fails There exists vapor in the refrigerant pipelines	Check for dirt or rust in the expansion valve and replace it when necessary ●Dredge the pipelines with compressed air and nitrogen

The pressure at the high pressure side is higher than the specified value or is too high; the pressure at the low pressure side is too high; the air conditioner is under refrigeration; the compressor makes exceptional sounds (especially when just starts the engine).	The refrigerant in the refrigerant pipelines is excessive The expansion valve fails or the compressor is disabled	Evacuate the refrigerant ●If the volume of the refrigerant is normal 1. Replace the expansion valve 2. Refill the refrigerant to the system 3. Test the pressure again ●If the refrigerant is obviously excessive 1. Refill the refrigerant to the system 2. Test the pressure again. Note: If the system is still off normal after retesting the pressure, install the expansion valve, have it replaced and dredge the pipelines with compressed air and nitrogen, and then further replace the compressor and the fluid reservoir and drying chamber.
When turning off the engine, the pressure at the high pressure side slightly rises while the pressure at the low pressure side slightly falls; the air conditioner is under refrigeration.	The compressor is disabled	Dredge the pipelines with compressed air and nitrogen Replace the compressor and the fluid reservoir and drying chamber
High pressure side is correct, low pressure side is too low, AC refrigerating correct, sometimes the evaporator has ice (even the refrigerant quantity is correct)	The expansion valve fails or the compressor is disabled	Replace the expansion valve Refill the refrigerant to the system Test the pressure again Note: If the system is still off normal after retesting the pressure, install the expansion valve, have it replaced and dredge the pipelines with compressed air and nitrogen, and then further replace the compressor and the fluid reservoir and drying chamber.
1. High/low pressure sides are correct, AC refrigerating deficiency. 2. High/low pressure sides are correct, compressor is abnormal (especially when the engine is started), AC refrigerating good	The transmission oil in the air conditioner pipelines is excessive	Evacuate the refrigerant ●Dredge the pipelines with compressed air and nitrogen Note: Adjust the volume of the lubricant when replacing such component of the air conditioner system as the compressor
The reservoir can not be used	• Puncture • The sealed part is damaged • Thread of fasten part is damaged, outside air entering to system	Replace

CHAPTER IX Body Dimension

I. Basic Instructions on BIW Maintenance

Vehicle body maintenance should be carried out by professionals according to the requirements of the manufacturer, and only in this way will the promises of "rust free" and "paint defect free" be effective.

1. Only adopt the materials specified by the manufacturer;
2. When welding the outside metal of the vehicle body, make sure protective coating is applied to the inner side;
3. When spot-welding, make sure zinc coating is used;
4. Before air-tight sealing the welded parts, apply a layer of filling coating to the inner side and outer side;
5. Before protecting the chassis with paint, apply protective coating to protect the chassis from rock bumping;
6. When the coating is sprayed, all opening parts at this position should be secured with fasteners;

In some cases, the vehicle must be placed on a hoister platform, for removal of spare parts may affect the distribution of various parts in the vehicle body.

Before spot-welding, make sure the battery connector is unplugged, and check if the ventilation is good enough before welding.

In maintaining the vehicle body in a certain area, take care to protect other vehicles in this area.

Be particularly careful when spraying sand or welding near the oil tank or fuel system, and disassemble them if the safety can not be assured.

When maintaining or spray-painting the vehicle body, take all possible measures of preventing accidents.

When welding galvanized steel sheets, the spot-welding current should be raised by 30%, and the electrodes should be pointed, and the clamping force of the electrodes should be increaded; and when doing gas shielded welding, the welding current should be further intensified.

Do not weld the air-conditioning parts or try to weld the parts on the vehicle whose temperature are easily raised. When spray-painting the vehicle frame, the temperature either in the drying oven or the pre-heating oven should not go beyond 80˚C.

Take the following measures during welding operation to prevent shaking the electronically welded equipment:

1. Connect the grouding of the electronic welding equipment directly to the welded parts. And check to make sure no other parts or insulative parts exists between the ground wiring connector and the spot-welded parts;
2. First disassemble the ECU, and prevent the electronic device or circuit from contacting the ground wiring connector or welding wire.

Corrections:

The vehicle body and the chassis are manufactured off the production-line by low-temperature tempering and cold die casting. Therefore, when the metal parts are damage in any accident, the same processes must be used to restore them, and no heating is allowed. If they are damaged very seriously and can not be restored, the damaged parts must be removed after the connecting surface is corrected.

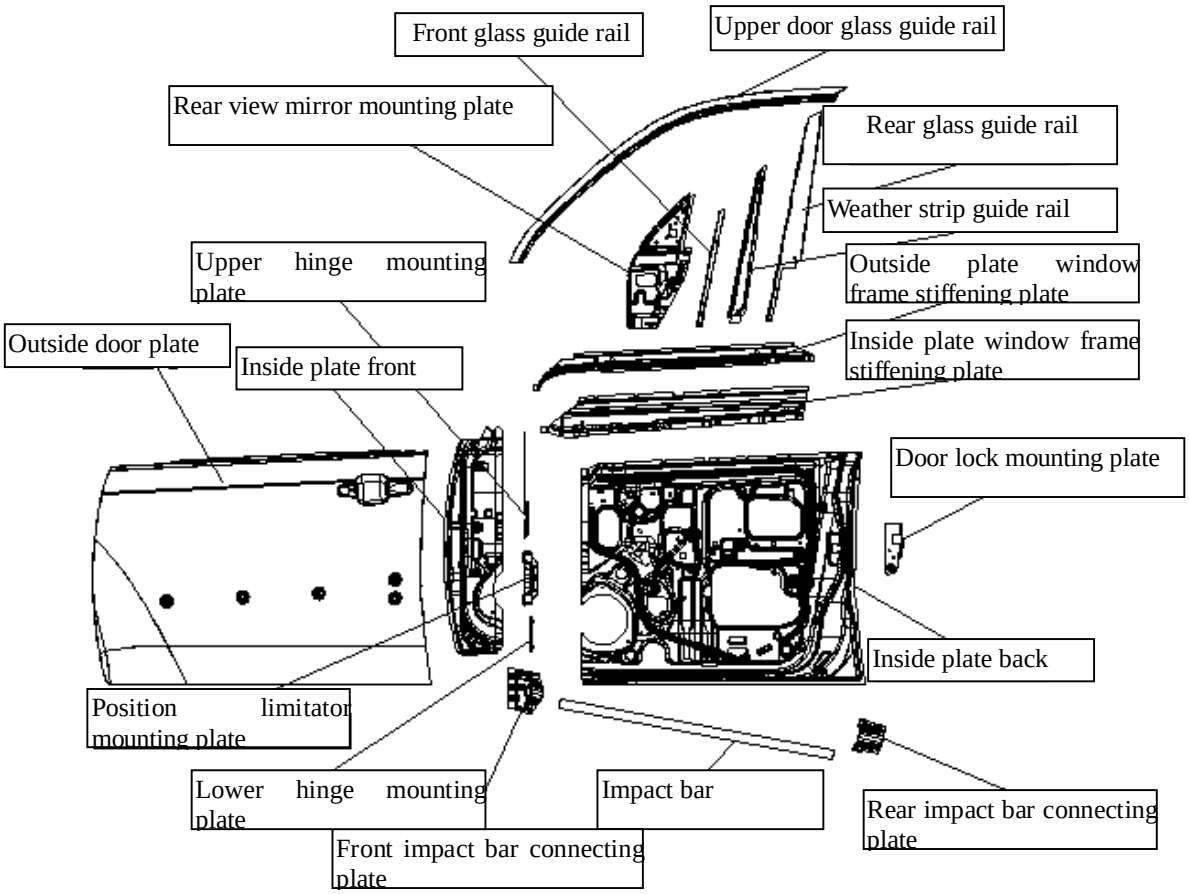
The car bodies are made up of various members, pressing panels and other parts, of which the doors are the most complexly processed parts of the vehicle body. They involve processes like part stamping and welding, assembly of spare parts and assemblies, for which the dimensional fits and technical requirements are quite

strict, so the car doors are difficult to maintain and the quality requirements are fairly high, and only the service personnel understand the structure of the car doors thoroughly and are qualified for the maintaining operations.

1. Vehicle Door Structure

Generally speaking, the vehicle doors consist of outside plates, inside plates, window frames, glass guide rails, hinges, locks and window accessories and so on. The inside door plates are equiped with accessories including glass lifter, locks and so on. To secure the assembly, some parts of the inside door plates need to be fortrified. To increase safety level, the inner parts of the outside plates are usually equipped with impact bars. The outside plates and inside plates are connected by flanging, adhesion, seam welding and so on. Depending on different bearing capabilities, the outside plates should be light and the inside plates should have higher rigidity and be able to stand stronger impact.

The BIW vehicle door assemblies have relatively fewer components, and usually consist of inside plates, outside plates, glass guide rails, window frame reinforcing plates, lock mounting plates, hinges reinforcing plates, impact bar assemblies and so on; The figure below is a typical structure drawing of a vehicle door.


Front glass guide rail
Upper door glass guide rail
Rear view mirror mounting plate
Rear glass guide rail
Weather strip guide rail
Upper hinge mounting plate
Outside plate window frame stiffening plate
Outside door plate
Inside plate front
Inside plate window frame stiffening plate
Door lock mounting plate
Inside plate back
Position limitator mounting plate
Lower hinge mounting plate
Impact bar
Rear impact bar connecting plate
Front impact bar connecting plate

2. Door panel Maintenance Process

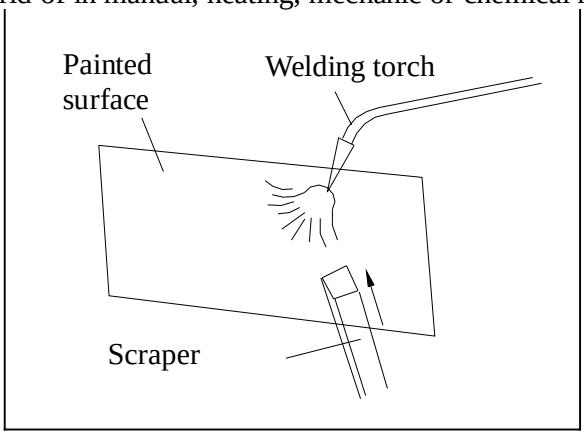
Generally speaking, the basic maintenance methods for car doors and hoods are the same as those for ordinary plate work, and the following steps apply to both of them:

（1） Primary tests. The positions of the door panels as related to other assemblies of the vehicle body as well as the dimensions of their tolerance clearances should be tested;

（2） Clean the vehicle doors. Use fresh water or detergent to clean the dirt and greasy spots on the door panels, and let them thoroughly dry for tests.

（3） Maintenance appraisal. Appraise the scope and degree of damage to the door panels by testing and decide the maintenance methods.

（4） Clear the old paint. Before cleaning or maintenance, get rid of the old paint according to the actual situation, especially when there exists obvious rust, cracks or dents; The paint can be got rid of in manual, heating, mechanic or chemical metchod(s).



（5） Tests after the removal, including the measurements of the geometric dimensions between various plate work pieces, tests of specific damage spots of various plate work pieces, recognition of damage types, analyses of damage causes and choices of maintenance schemes.

3. Main Contents of Door Panel Maintenance

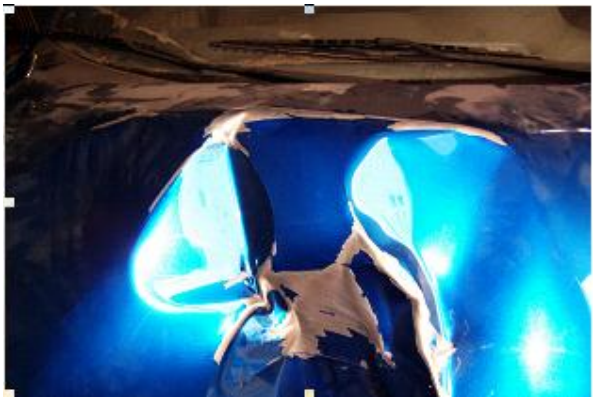
Generally speaking, the causes of door panel damages are related to the following 4 aspects: structure design defects, manufacturing defects, chemical erosion, and physical damage. And the most common damage causes can be classified as the following types:

1. Abrasion: The surfaces of plate work pieces may contact each other and relative movements will take place and cause surface friction, which will lead to abrasion. For example, the long time friction between the hinge hole and the shaft of the vehicle door hinge will increase their tolerance clearance and cause to vehicle doors to drop.

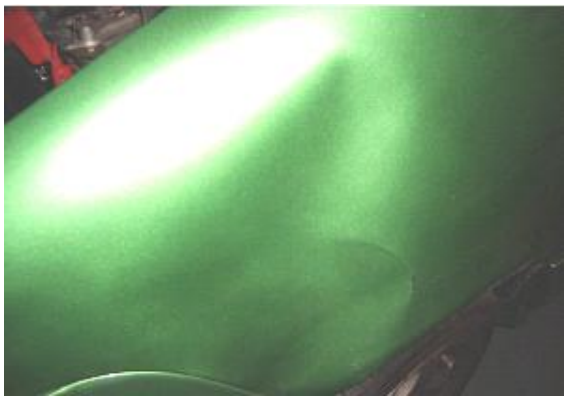
2. Erosion: This is generally due to the oxidation caused by the mud deposit and dirt; or the rust caused by lack of anti-erosion processing after welding; or erosion caused by chemicals. This type of damage usually occurs between the plate work pieces, in overlapped parts of spot-welded pieces, and at other similar places.

3. Cracks or breaks: The metal plates may develop fatigue under repeated inner/outer stress where the stress concentrates and the structure is the weakest, causing cracks and even breaks.

4. Dents or wrinkles: Dents develop because the door panel is subjected to bumping or pressing, leading to elastic or plastic deformations.



5. Bends or twists: They are mainly caused by too much load the door panel receives in use or the plastic deformation due to bumps.



4. Basic Methods for Door Panel Maintenance

The basic maintenance methods for the above door panel damage types include dent reconditioning, flame correction, welding, repairing and mending, wrinkle spreading and so on.

4.1. Reconditioning of Dents

For convex-concave damages in the outside door panels, if they are indirectly caused by structural pieces or reinforcers, the structural pieces should be corrected first, and then the outside panel breaks or dents are to be corrected. If the backs of the metal panels are accessible, hand hammers and underlay irons or spoon-shaped irons, tommy bars, flat punches and so on can be used for primary repairs. For enclosed metal panels or parts that are difficult to access from the backs, other tools can be used for repairing, such as slide hammers and pointed hammers.

Here are some common ways of dent reconditioning:

(1) Repair the dents with underlay irons and hand hammers: the commonest practice is to beat the damaged metal panels with underlay irons and hand hammers. Both sides of the metal panel to be repaired must be accessible to the hand-held underlay iron and there are two ways of using the underlay iron as the supporting piece for the hand hammer:

① Beat with a hammer from above the underlay rion. This approach is suitable for correcting smaller and shallower dent or breaks.

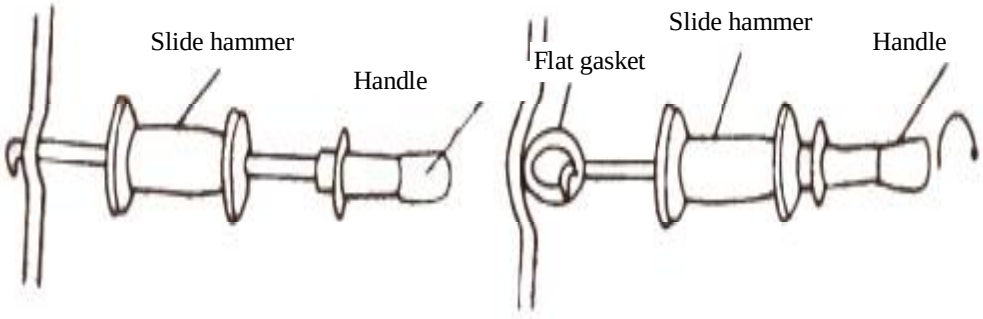
When beating with a hammer from above the underlay rion, the hand-held underlay iron should be placed against the back of the metal panels, and then beat the convex part. The beating of hand hammer can make the metal panel contract and finally smooth the metal panel.

② Beat with a hand hammer from other parts than from directly above the underlay iron. The underlay iron is placed against the lowest part of the dent, and then the higher parts near the dent are beaten with a hand hammer.

Generally, when trying to repair the dent with a hand hammer and an underlay iron, the convex side is beaten with the hand hammer and the concave side is pressed against the underlay iron. First do brief correction by beating the damaged part with a wooden hammer, and then do finer repairing with an iron hammer. For a larger area of dent, the underlay iron should be placed against the place where the dent is shallower, and the hand hammer should beat the higher parts. Besides, the wooden hammer and the iron one should be used alternatively according to the actual situation.

(2) Repair the dent with a shaping spoon or tommy bar. Shaping spoons and tommy bars are commonly used tools for door panel maintenance, and they are customized according the characteristics of the vehicle body. They can reach the limited space between door panels to push up the dent. This method is suitable for the narrow room between the door panels where it is inaccessible for the underlay iron or the hammer, and the shaping spoon can act as a underlay iron to distribute the impact of the hammer over a larger area.

(3) Restore the dent with a dent smoother. The dent smoother is applied to the inner side of the metal panel and it is used for the dents that are hardly accessible to other tools and it is usually operated in the following two ways:



Puncturing: Drill a small hole in the dent with a hand power drill, and then insert a pull-rod with threaded head or hook-shaped head into the hole. Slide the slide hammer on the metal pull-rod and impact the handle repeatedly so as to pull up the dent gradually. Make more than one holes when necessary, and fill the hole(s) by soldering and polish the spot(s) when the dent(s) is/are smoothed.

Electrode welding: Weld a peg or a flat gasket onto the dent with a special spot-welder, and then use a dent smoother to pull at the peg or flat gasket till the dent is smoothed. More than one peg or flat gaskets can be welded when necessary so that the whole dented area can be dragged out. Finally, break the peg or flat gasket, and polish the welded scar with a sand mill. This method can avoid drilling the metal panels and prevent potential erosion, so it is widely used.

4.2. Restoration of Stretched Parts

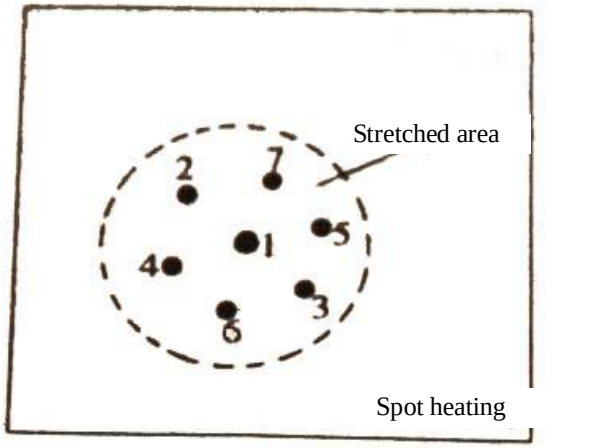
When the metal panel is impacted, the dented area would be stretched. At times even proper operations can not restore it, the heating-contracting method is sometimes used to achieve the desired repairing effect.

(2) Heated position and flame intensity: The effect of flame correction depends on the heated position and the flame intensity. Different heated spots bring about different effects, and the heated position should be where the material is deformed the most and the metal panel is stretch the most, or the furthest part outward that is bent and deformed. Different flame intensities also lead to different correcting effects. The intenser the flame is, the faster the metal panel is heated and the more concentrated the heat is, and then the stronger the contracting capability is. The low-carbon steel panel, for example, should be heated till it gets cherry red (600℃ - 800℃).

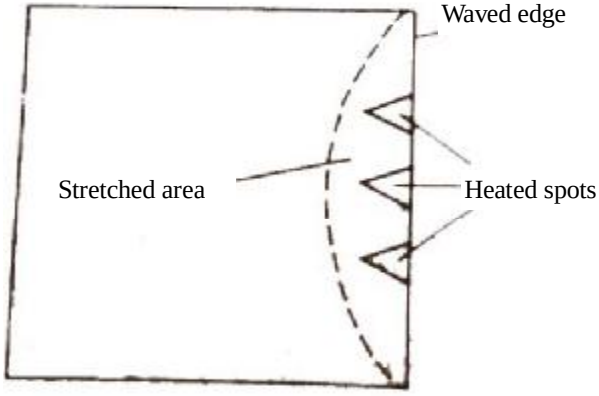
(2) Heating ways normally adopted for flame correction in the vehicle body maintenance are:

① Spot heating: The heated area is a round spot of a certain diameter, which is usually 15 - 30mm. One or more spots can be heated according to the actual deformity situation. When more than one spot is heated, the spots are arranged in a plum pattern. And this way is often used for contracting the convex area in the middle of the panel.

② Triangle heating: The heated area resembles a triangle, and this way is often used for correcting strip-shaped materials and deformed panel edges.



Spot heating



Triangle heating

（3）Cooling-contracting way: When the flame is taken away, proper cooling ways should be chosen according to the stretched degrees of the metal panels. Different cooling ways bring about different contracting effects.

① Natural cooling-contracting, or cooling in the air naturally, which is suitable for smaller areas of deformities.

② Water cooling, or covering the heated area with wet cotton cloth to make it cool suddenly. The contraction of metal plate cooled in this way is larger than that of the naturally cooled one, but it may make the steel panel fragile.

③ Natural cooling and hammering, usually operated with a hand hammer and a underlay iron. During the operation, beat around the heated area quickly to increase the compressing stress and the contraction till that area is smoothed. The wooden hammer is preferred and do not use too strong a force, or the metal panel may get re-stretched.

4.3. Restoration of Cutting & Patching

When any part of the metal door panel is eroded or damaged beyond repair, it should be removed and replaced with a new piece by welding. The repairing methods include patching repair and cutting.

Steps for cutting repair are as follows:

（1） Check the damaged part and determine the repairing area.

（2） Make a paper model according to the determined area.

（3） Draw lines on the metal plates and cut material according to the paper model, and leave proper processing allowance.

（4） Select proper processing and shaping methods so that the patch matches well with the

part to be removed.

（5） Apply the patch to the intended position and press it tightly, draw a line along the edge of the part to be removed and cut it out, using methods like gas cutting or excising according to the actual situation, and then align the patch with the excised area.

（6） Weld the seam by gas welding or carbon oxide protection welding. Spot-weld it at a pace of 30-50mm to fix it and then weld it again in a certain order after beating it smooth. For seams requiring welding of higher strength, doulble-sided welding is prefered.

（7） Smooth the welded seam by beating it with flat hammer, release the welding pressures, and then shape it and polish the seam with a grinding machine.

4.4. Restoration of Wrinkled Parts

Depending on the damage extent of the plate work pieces, the wrinkles are divided into “live wrinkles” and “dead wrinkles”. The “live wrinkles” are slight ones and can be directly removed by beating the convex part with a hammer. The “dead wrinkles” refere to seriously damaged parts. Since the wrinkles are folded and pressed against each other, so if you hammer the most convex part, the wrinkles would get even more seriously and harder to release, hence the name “dead wrinkles”. The principle of correcting the wrinkles is to spread “dead wrinkles” first so that they become “live wrinkles”, and then “live wrinkles” are converted into convex-concave shape, and finally restore the damaged parts just as you deal with convex-concave damages. The repairing steps are as follows:

（1） First use support-draw method to apply a correcting force in the direction opposite to that of the impact at the wrinkled part of the plate work, and then spread and ease the wrinkles.

（2） Remove the wrinkled plate work and lay it on a platform and then, beginning with the inner side of the wrinkled area, pry up the wrinkles with a proper prying tool and heat the “dead wrinkles” one by one with a welding torch at the same time. Finally all “dead wrinkles” are pried up and eased and converted into“live wrinkle”.

（3） Beat and smooth the “live wrinkles” from the inner side outward. The hammered spots should be near the most convex part of the “live wrinkles”. At the same time make sure the platform can support every beaten spot. When the wrinkles in one side of the plate are almost smoothed, turn it over to beat the other side till all wrinkles are completely spread out.

（4） Measure with a templet, and at the same time heat and beat the convex-concave part to restore it to its original shape.

（5） When the vehicle body is assembled, test with a templet again and make finer correction to achieve the final requirements.

（6） The seriously damaged wrinkles that can not be restored can be excised and repaired.

4.5. Welding of Four Doors and Two Covers

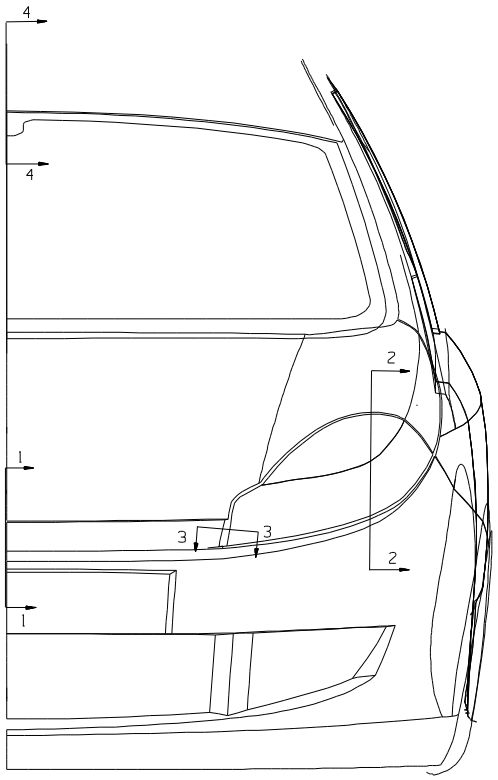
When welding the door panel, choose proper welding methods: gas welding (oxygen and acetylene welding), CO_2 shielded welding, manual arc welding, resistance spot welding, braze welding and so on. Besides, in order not to reduce the original strength and durability of the vehicle body, try to adopt the welding methods used in manufacturing the door panels, and the dimensions and types of all weld joints should be similar to those used by the original manufacturer.

As for appearance and quality, no burnt-through spots, half points, cracks, a lot of burrs or other defects should exist at the welded parts. The welded surface should be smooth and nice-looking, no obvious twist or deformation is allowed, and the indentation depth should be less than 1/5 of the plate thickness. Flat spade and iron hammer can be used to carry out non-destructive tests of the welded spots’ strength. Insert the flat spade between two welded spots to see if they are

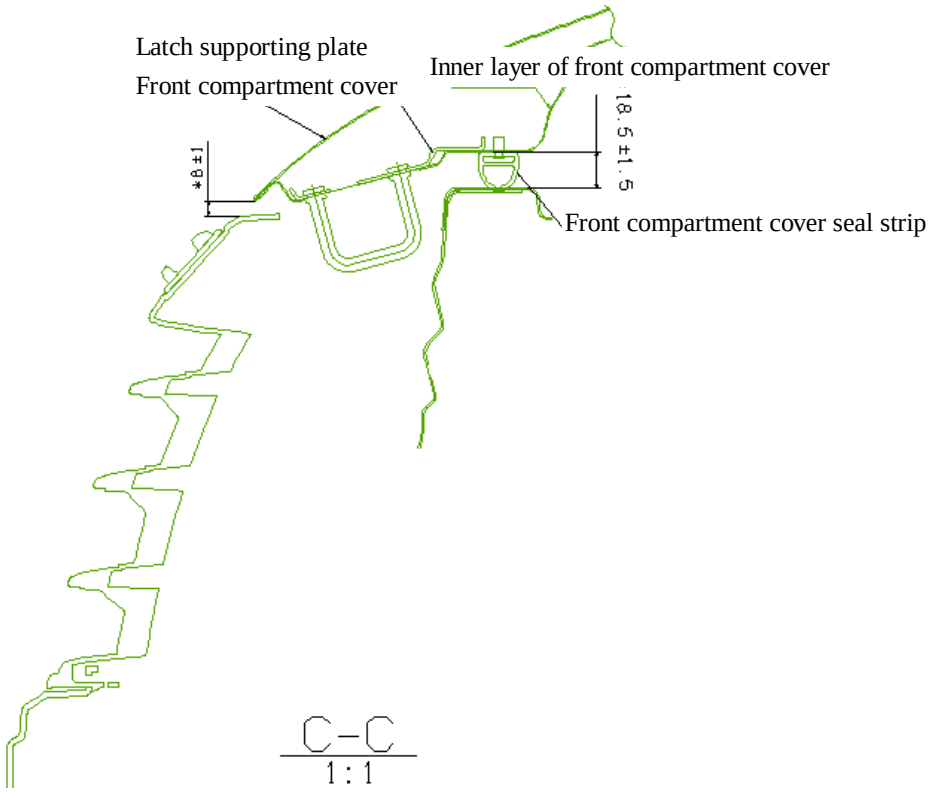
easy to separate, and then beat the welded part with an iron hammer to restore it. No welding spatter is allowed at the welded seam, and the overlapped seam should be nice-looking with no defects like air holes or cracks. Defects like undercut, welding beading and burning through are also not allowed.

II. Vehicle Body Assembly Dimensions

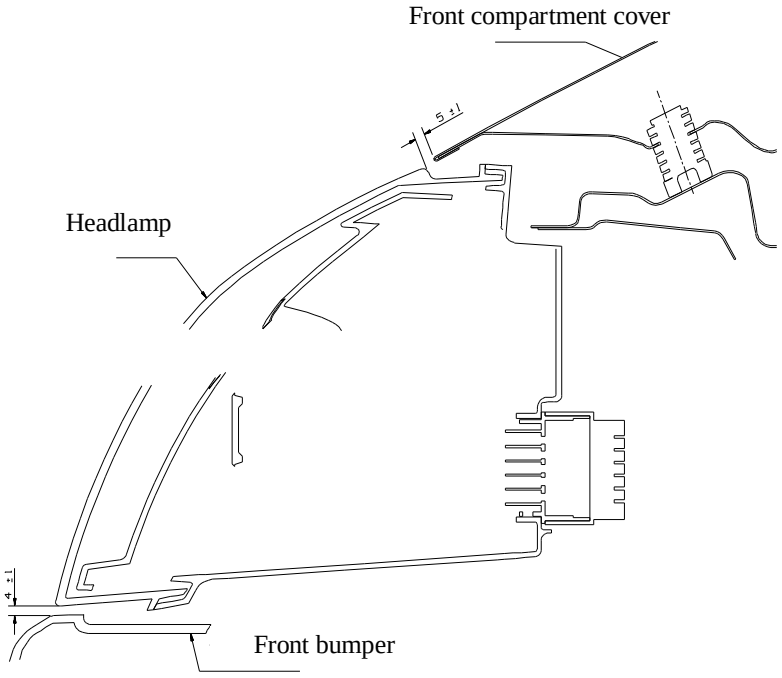
1. Front View



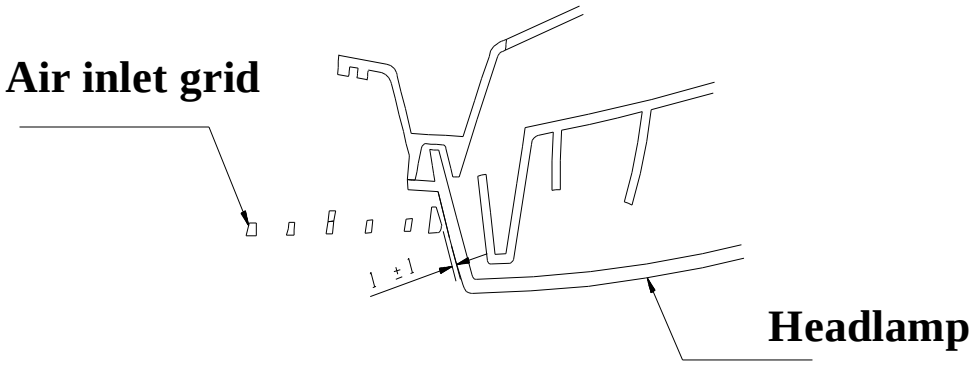
1.1. Clearance between front hood and air inlet grid at C-C: 8±1



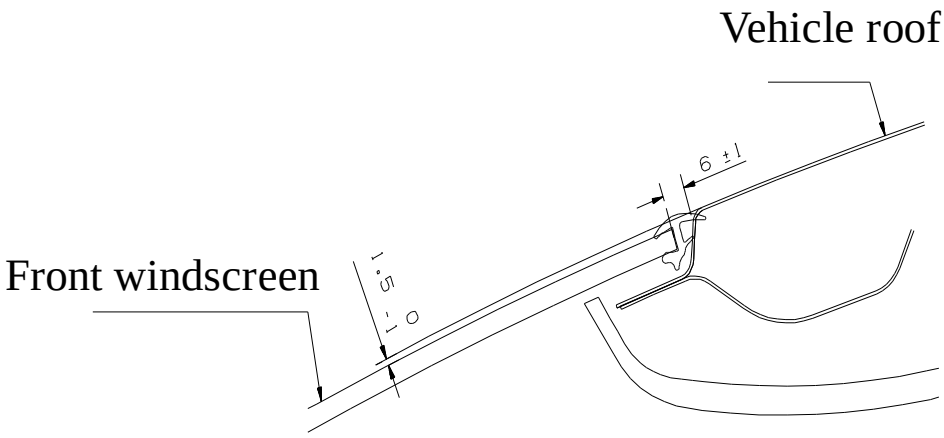
1.2. Clearance between front hood and headlamp at 2-2: 5±1mm



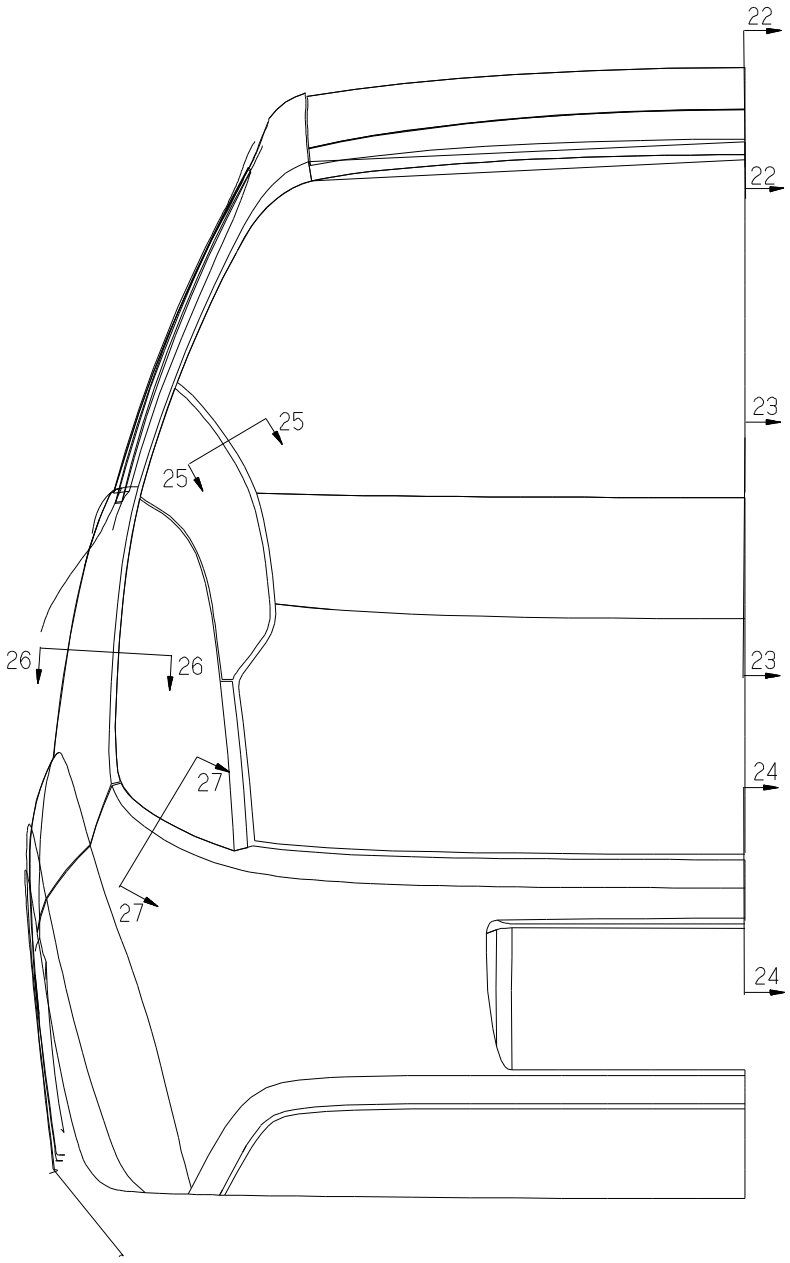
1.3. Clearance between headlamp and air inlet grid at 3-3: 1±1mm



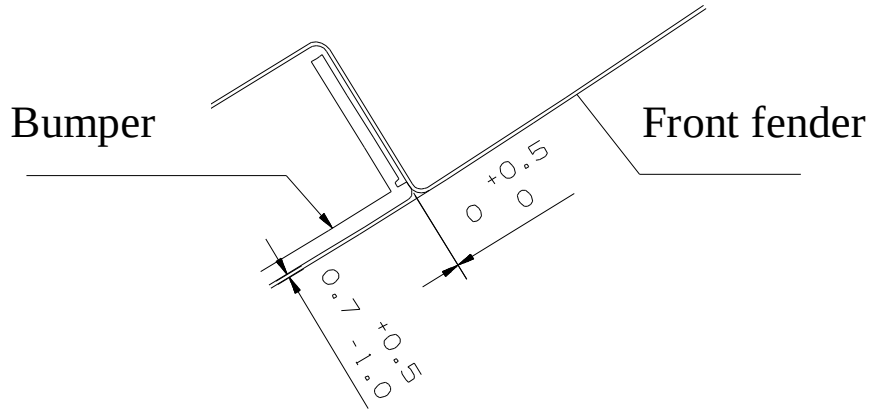
1.4. Clearance between the front windscreen and the vehicle roof at 4-4: 6±1mm



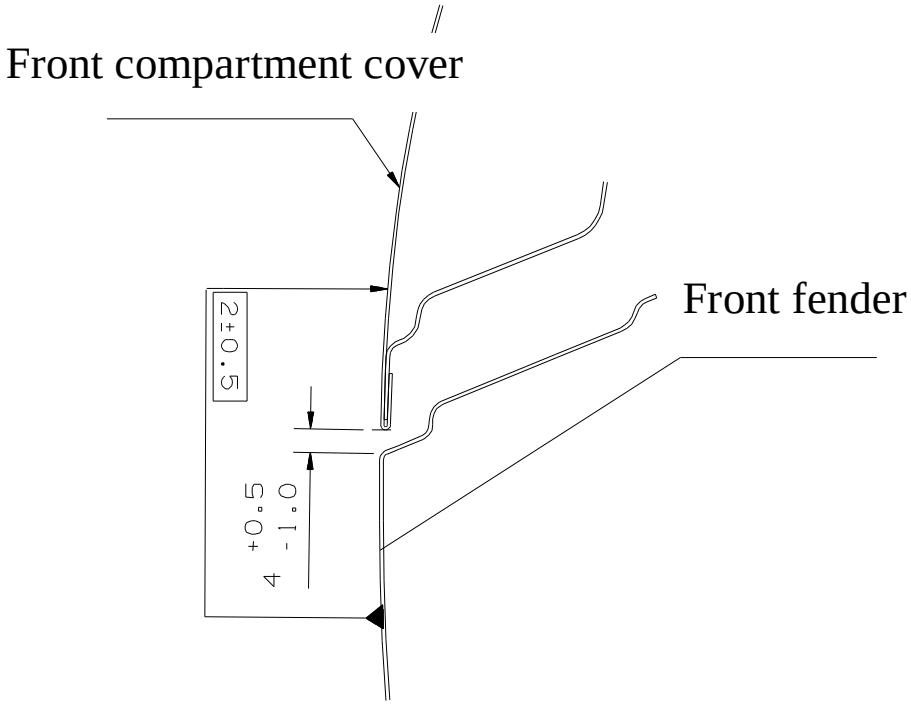
2. Left-front View



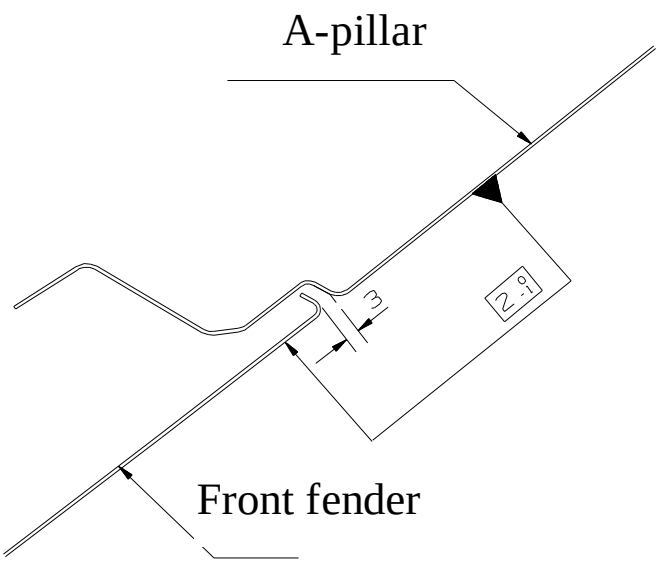
2.1. Clearance between front bumper and front fender at 5-5: $0^{+0.5}_{0}$ mm



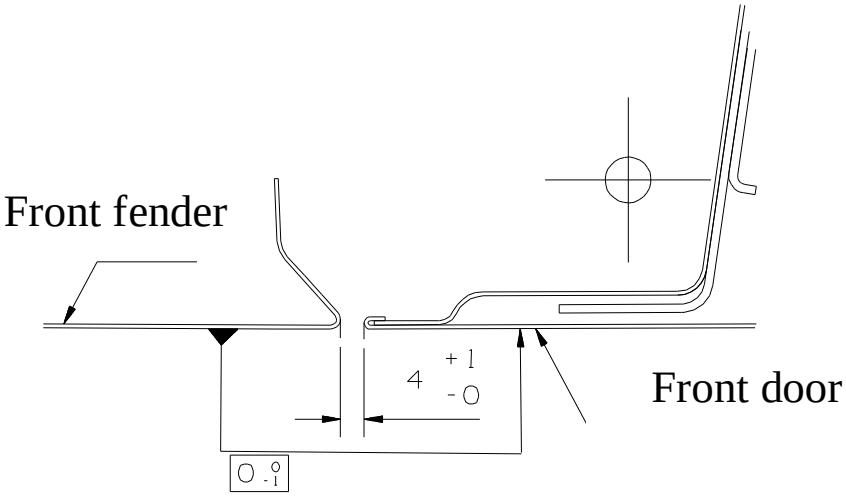
2.2. Clearance between front hood and front fender at 6-6: 4mm



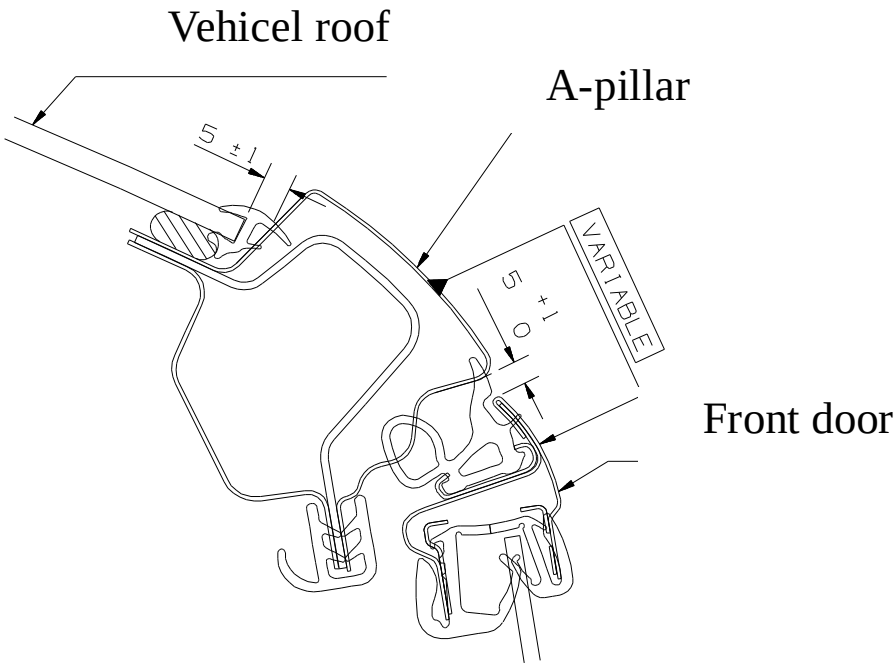
2.3. Clearance between front fender and A-pillar (side wall) at 7-7: 3mm



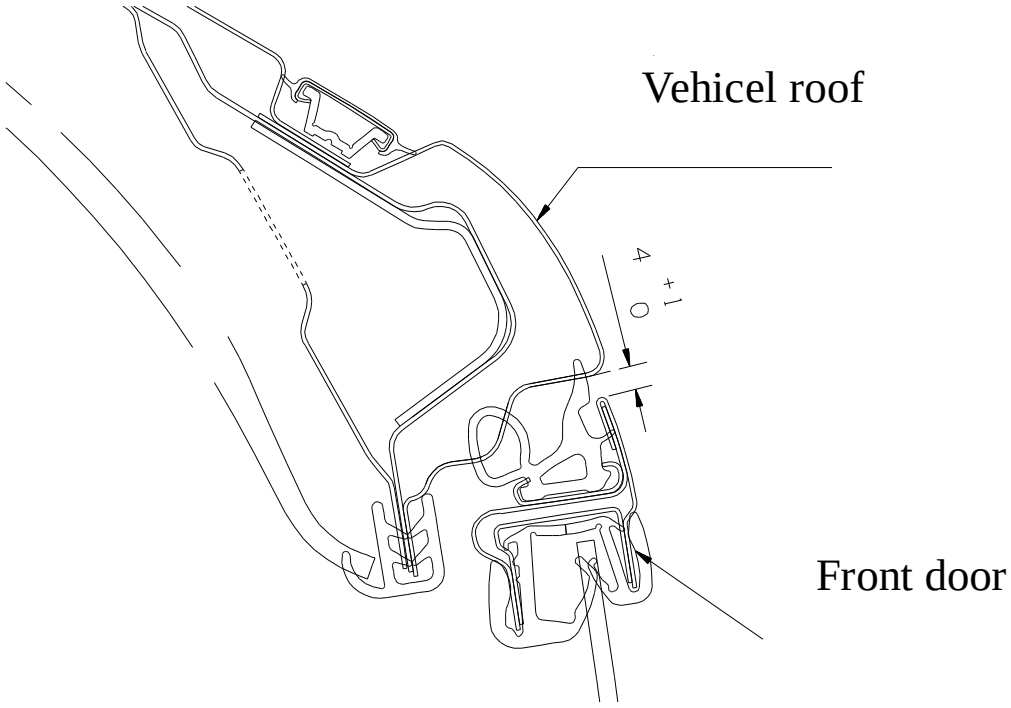
2.4. Clearance between front fender and front vehicle doors at 8-8: 4^{+1}_{0} mm



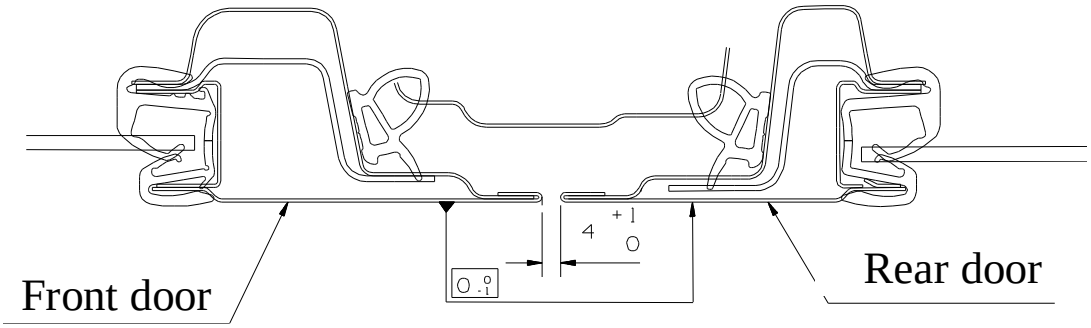
2.5. Clearance between front door and A-pillar (Side wall) at 9-9: 5±1mm



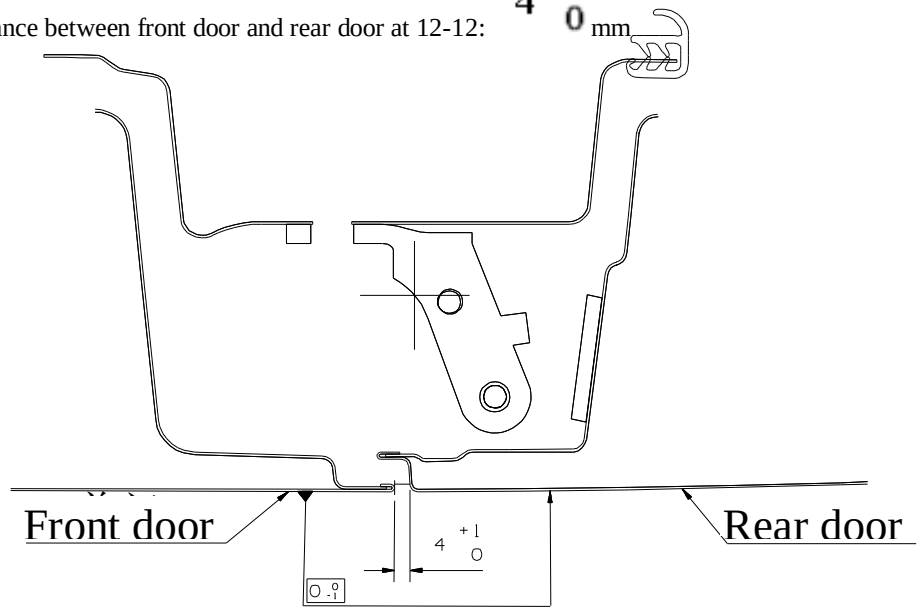
2.6. Clearance between front vehicle doors and vehicle roof 10-10: 4_0^{+1} mm



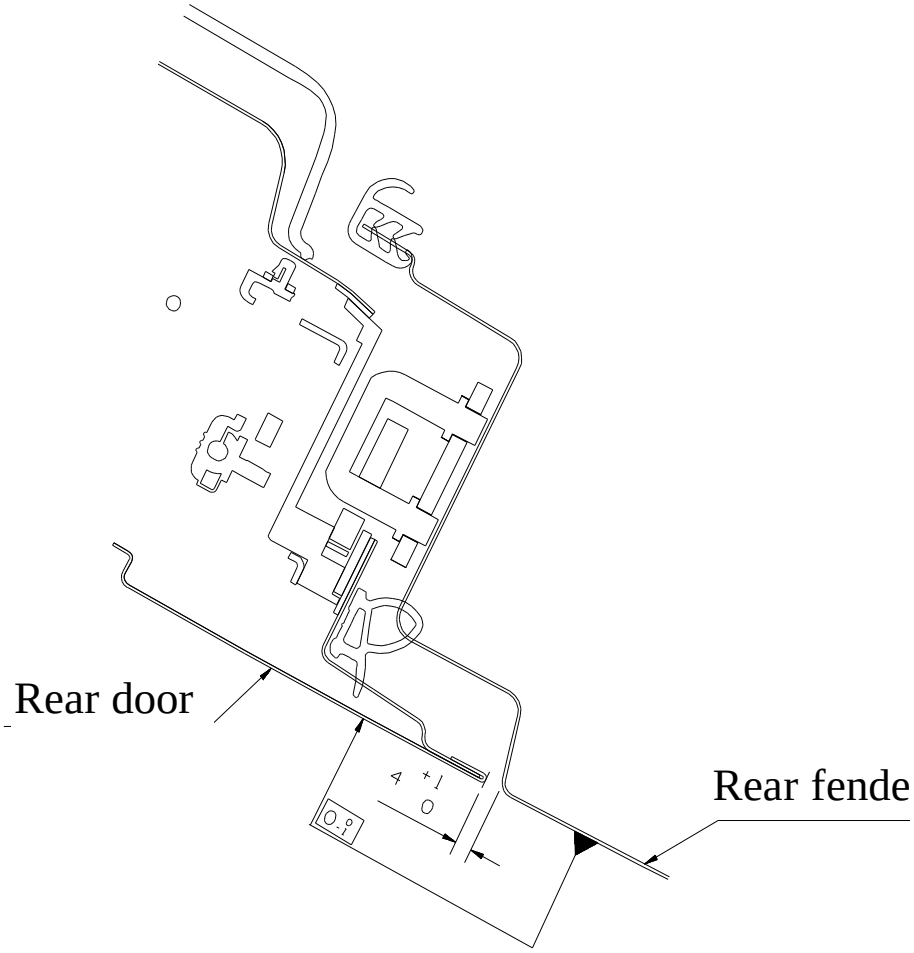
2.7. Clearance between front door and rear door at 11-11: 4^{+1}_{0} mm



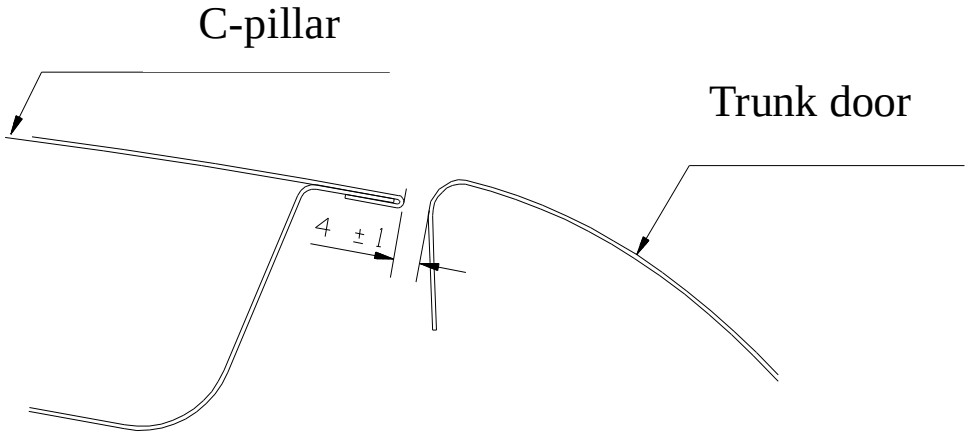
2.8. Clearance between front door and rear door at 12-12: 4^{+1}_{0} mm



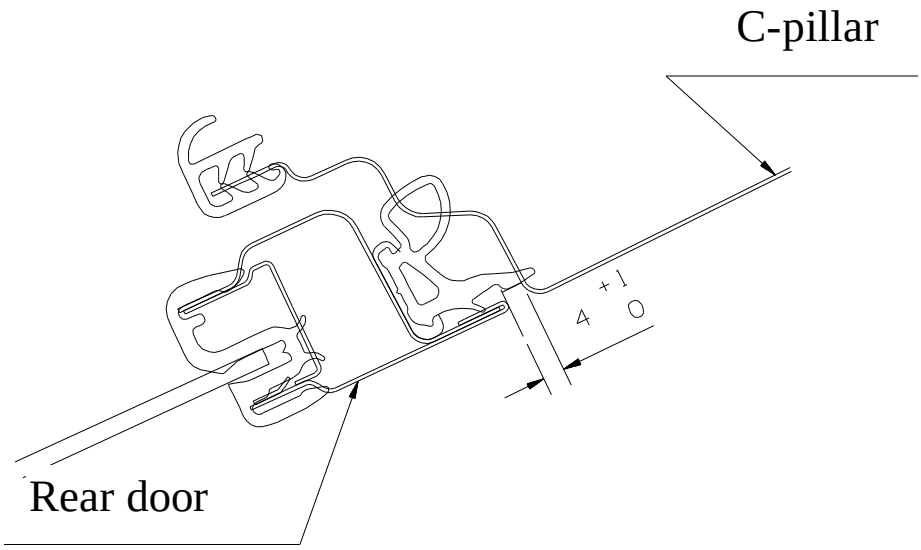
2.9. Clearance between rear door and rear fender (side wall) at 13-13: 4^{+1}_{0} mm



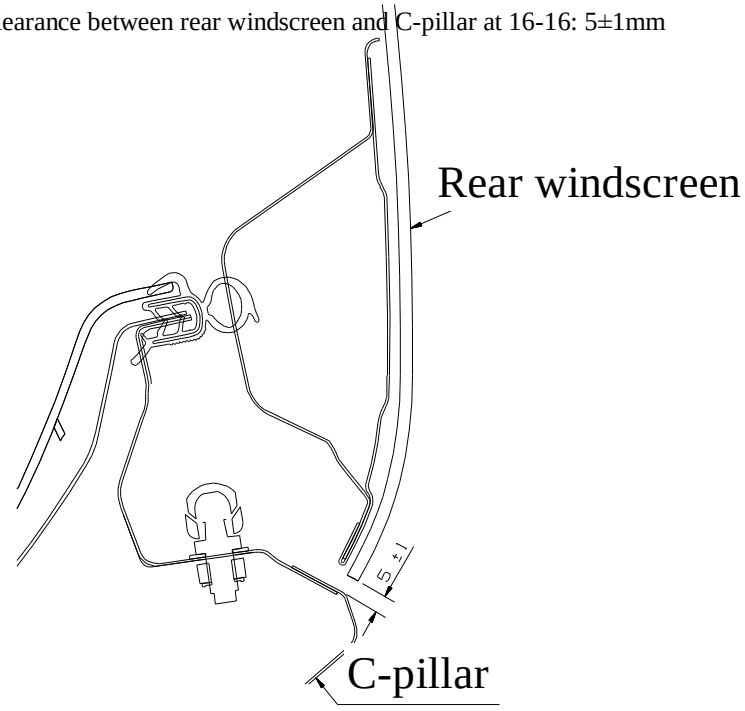
2.10. Clearance between rear door and rear fender (side wall) at 14-14: 4^{+1}_{0} mm



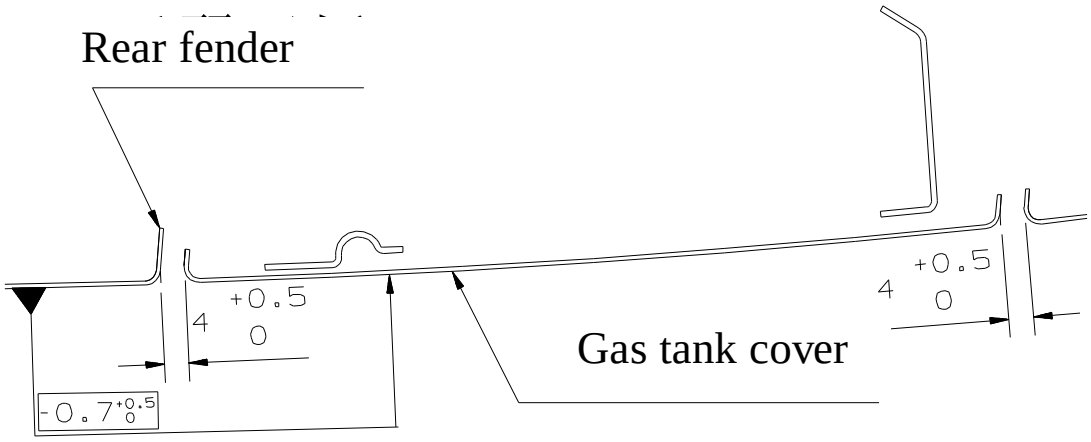
2.11. Clearance between rear door and C-pillar at 15-15: 4^{+1}_{0} mm



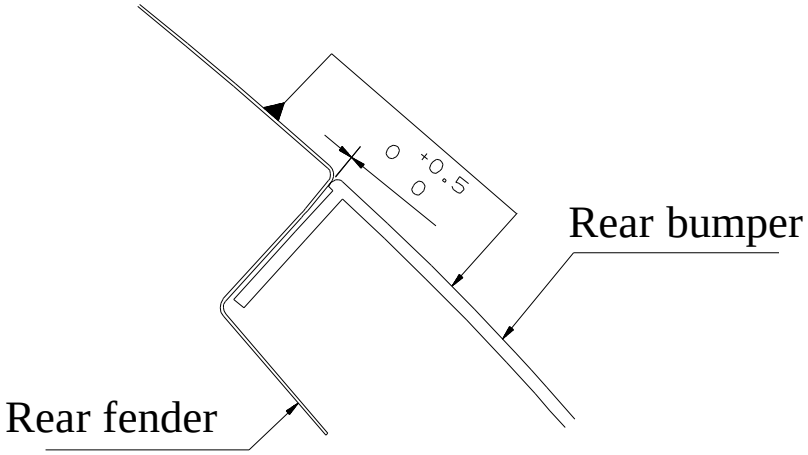
2.12. Clearance between rear windscreen and C-pillar at 16-16: 5±1mm



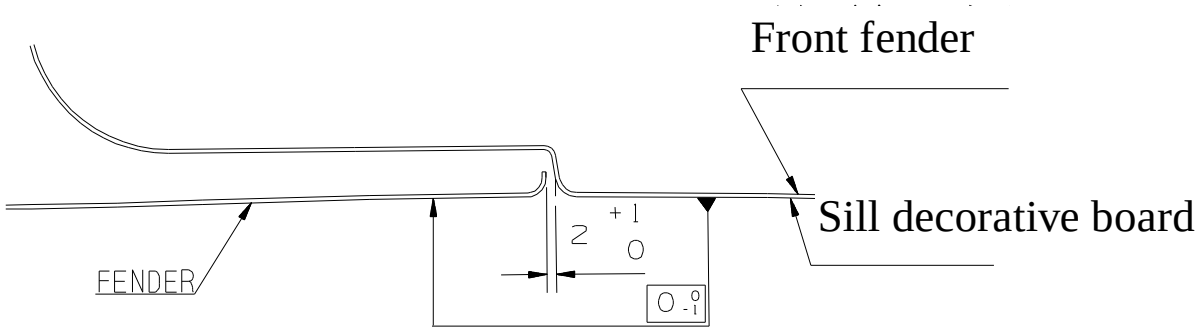
2.13. Clearance between gas tank cover and rear fender (side wall) at 17-17 and 18-18: $4_{0}^{+0.5}$ mm



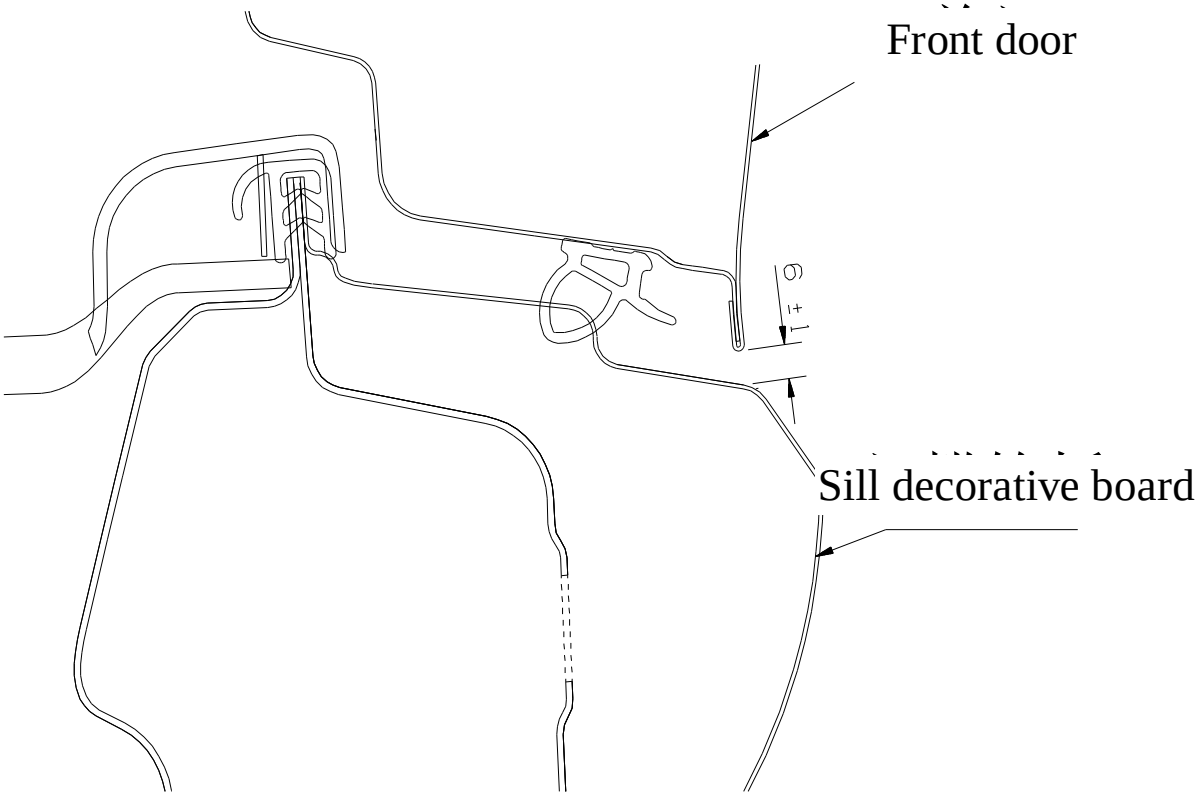
2.14. Clearance between rear bumper and rear fender at 19-19: $0_{0}^{+0.5}$ mm



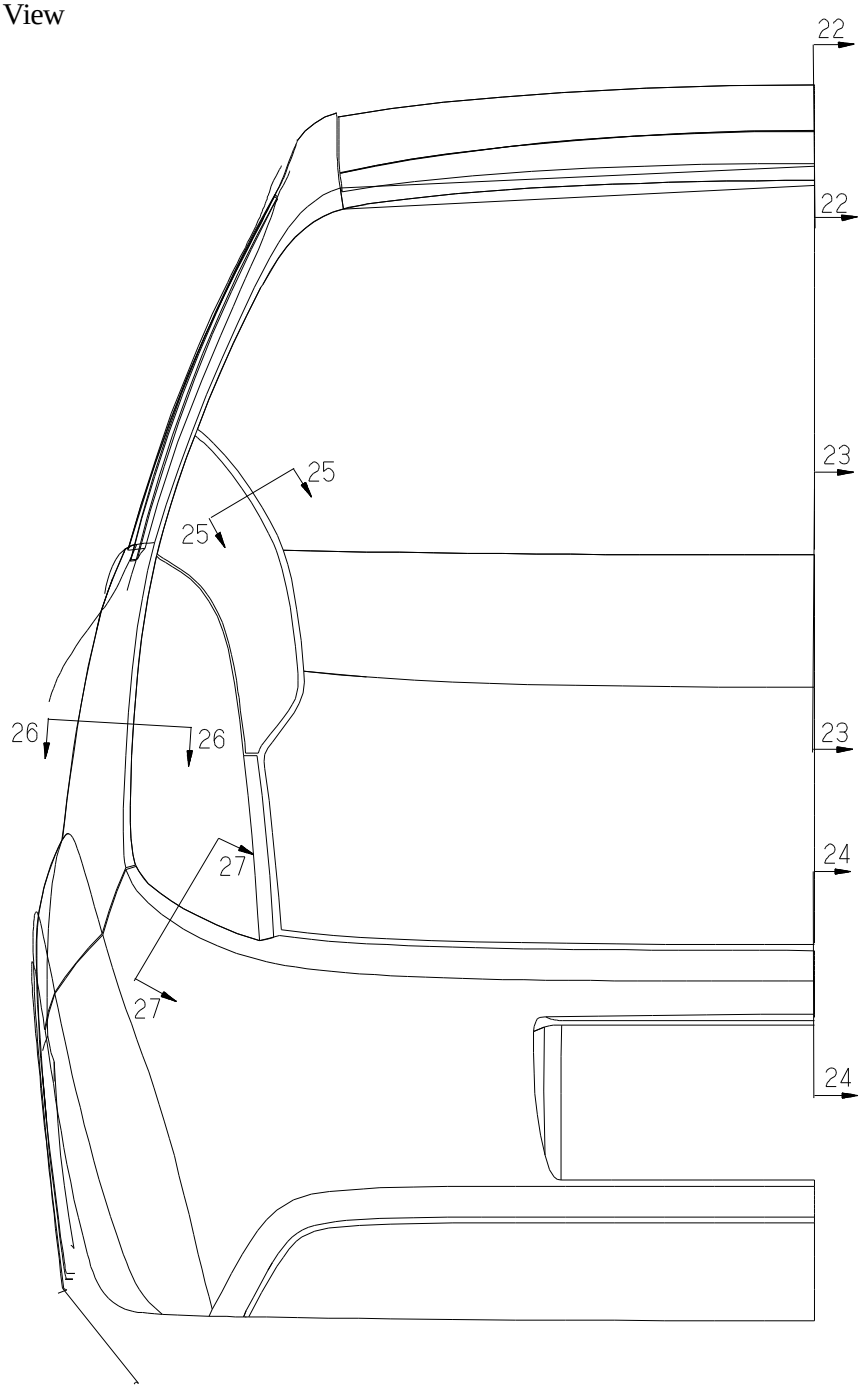
2.15. Clearance between front fender and sill decorative board (side wall) at 20-20: 2^{+1}_{0} mm



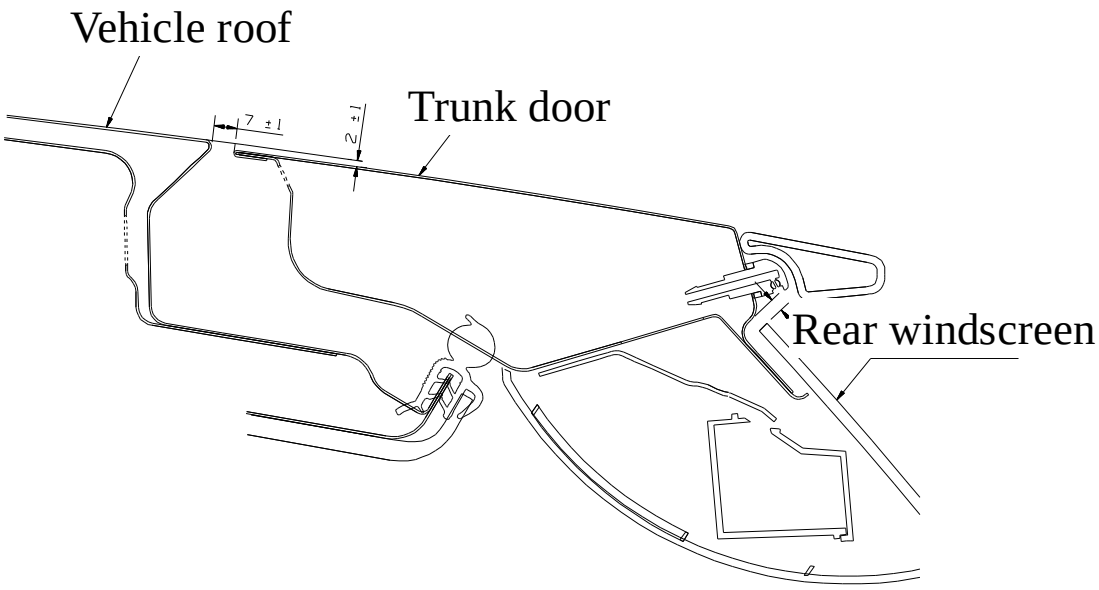
2.16. Clearance between front door and sill decorative board (side wall) at 21-21: 6±1mm



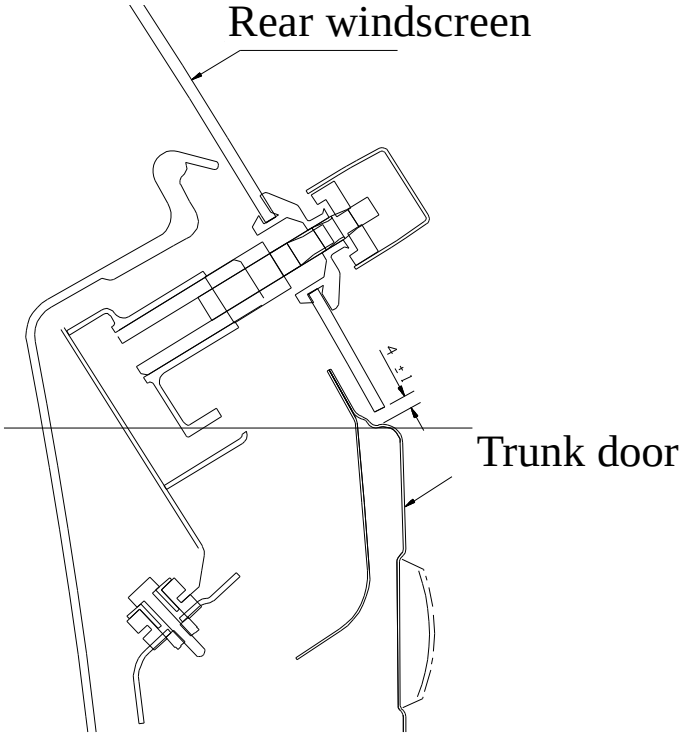
3. Back View



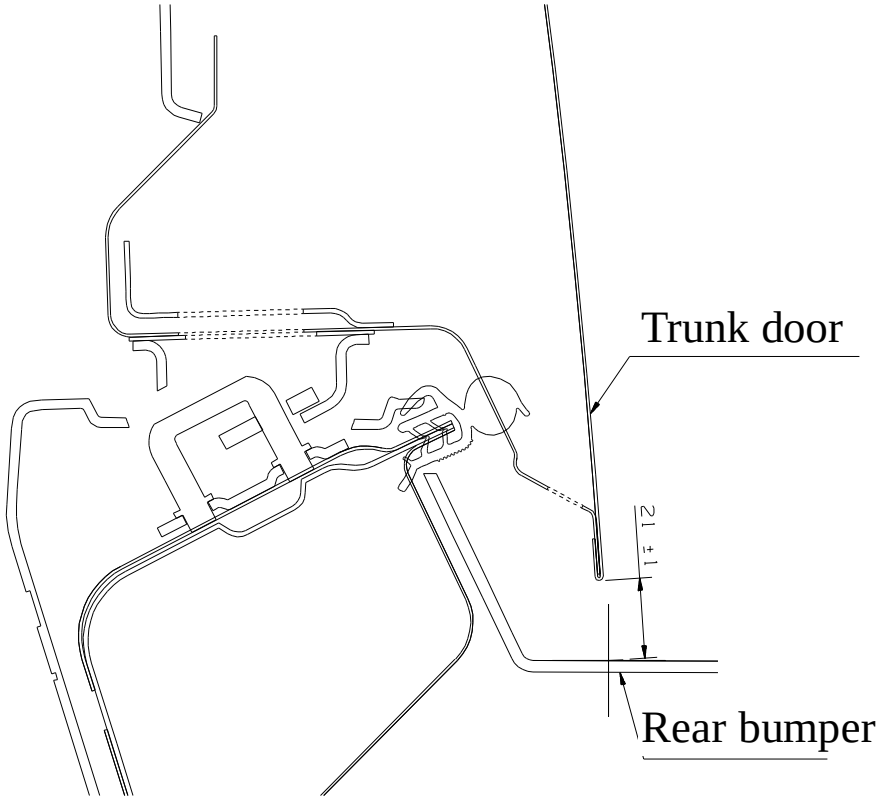
3.1. Clearance between vehicle roof and trunk door at 22-22: 7±1mm



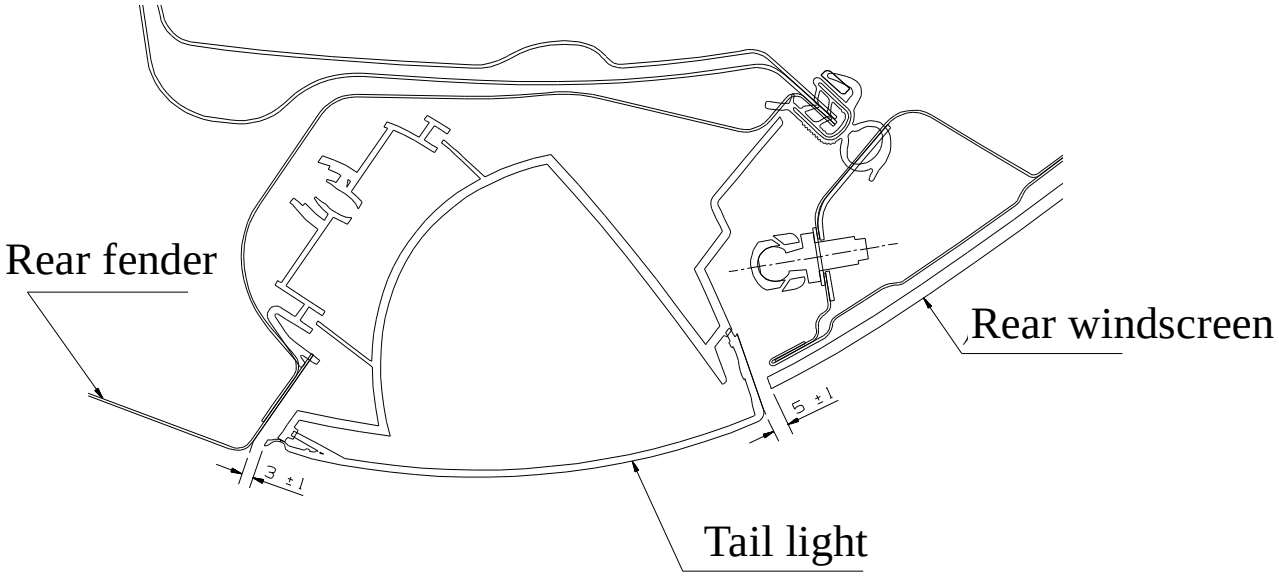
3.2. Clearance between rear windscreen and trunk door at 23-23: 4±1mm



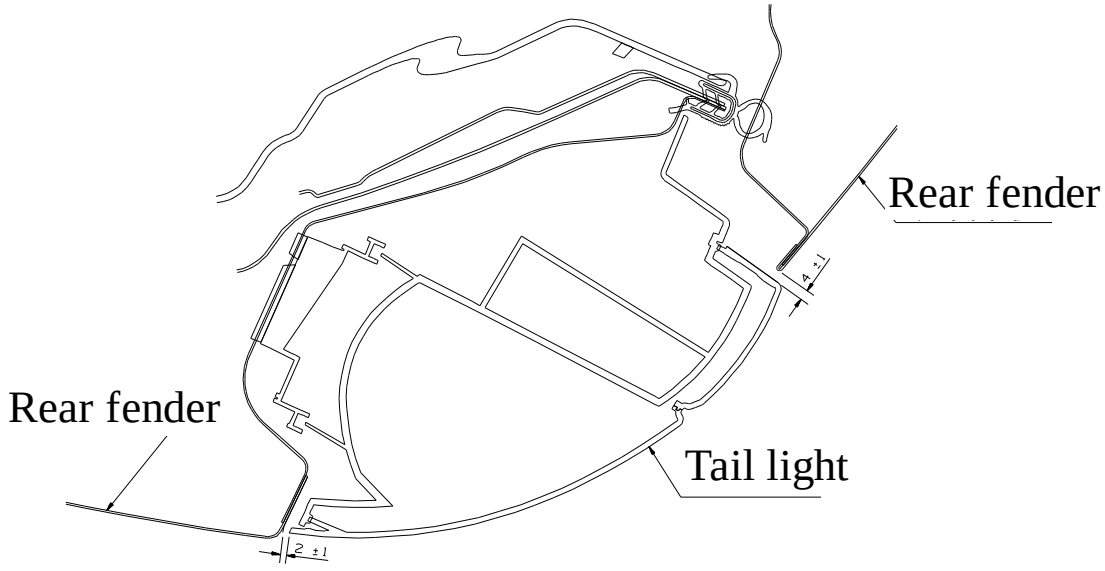
3.3. Clearance between trunk door and rearbumper at 24-24: 21±1mm



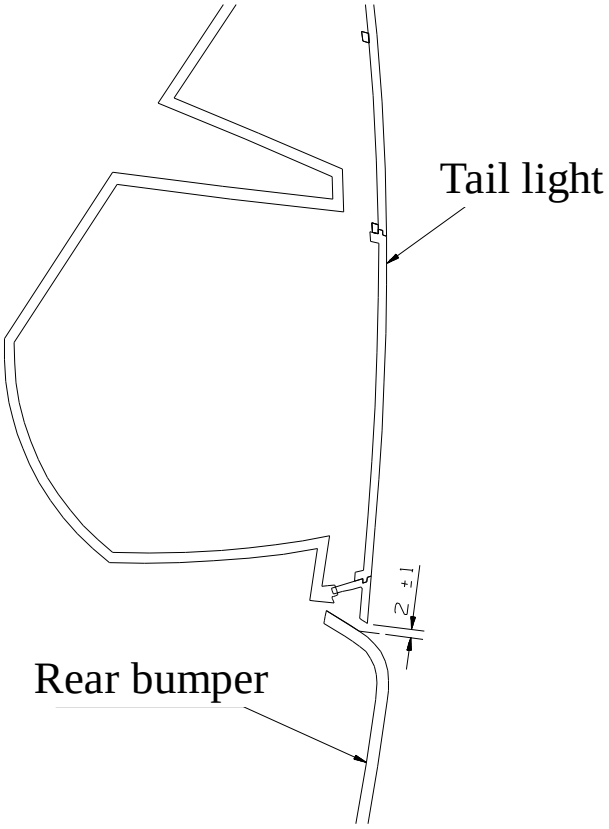
3.3. Clearance between rear windscreen and tail light at 25-25: 5±1mm



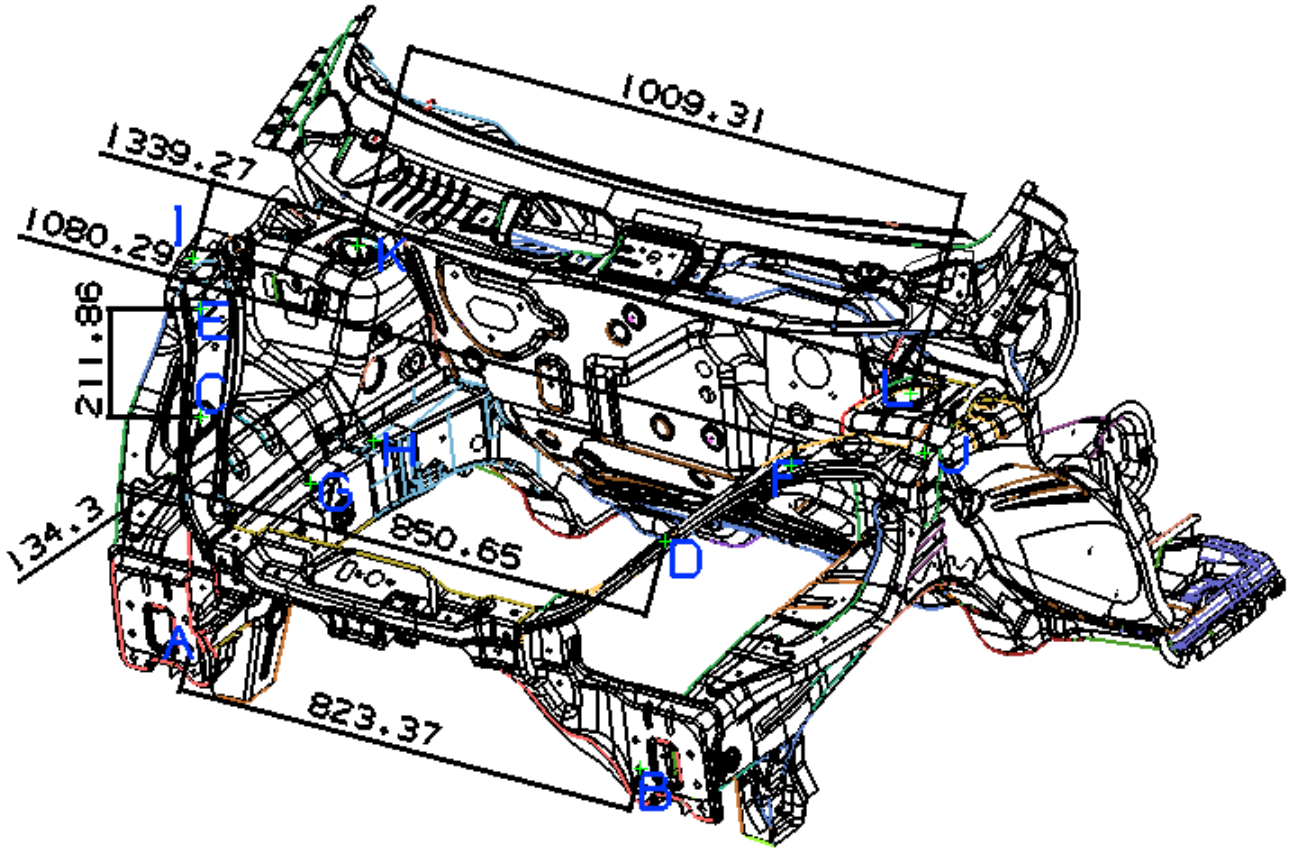
3.4. Clearance between tail lights and rear fender (side wall) at 26-26: 4±1mm



3.5. Clearance between tail light and rear bumper at 27-27: 2±1mm

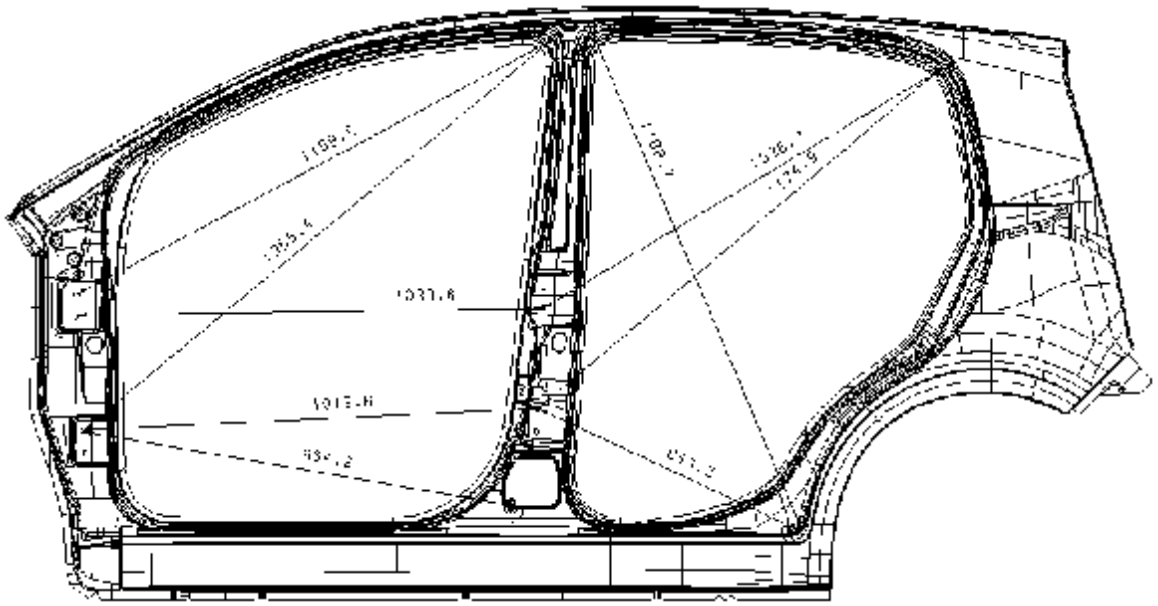


III. Engine Compartment Dimensions

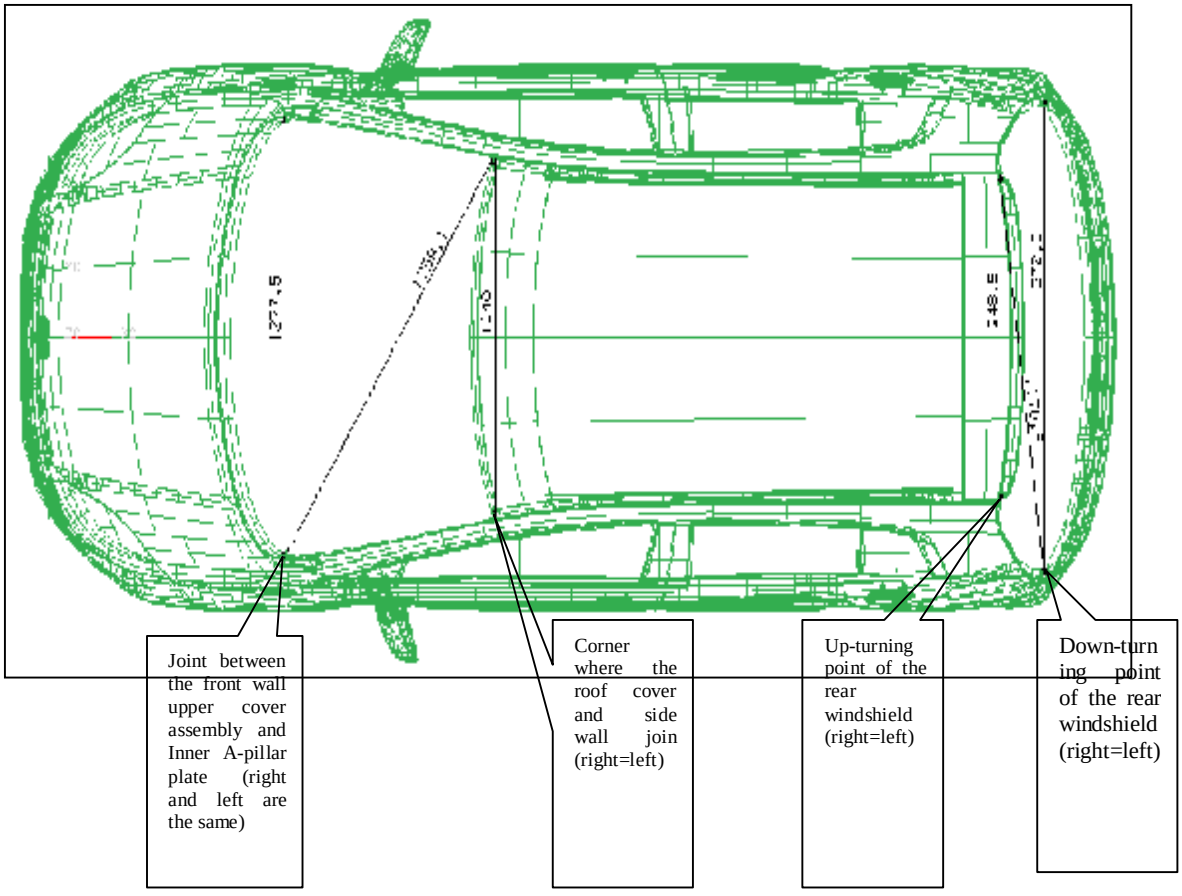


No	Name	Diameter
A/B	Front bumper crossbeam mounting hole	Φ11
C/D/E/F	Headlight mounting hole	Φ7
G/H	Engine right suspension bracket mounting hole	Φ13
I/J	Installation of fender	Φ8
K/L	Shock absorber mounting hole	Φ76

IV. Various Opening Dimensions



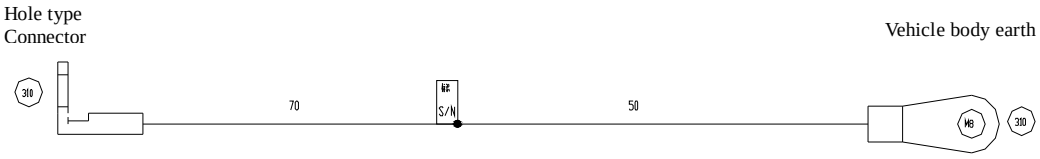
V. Windshield Dimensions


Joint between the front wall upper cover assembly and Inner A-pillar plate (right and left are the same)
Corner where the roof cover and side wall join (right=left)
Up-turning point of the rear windshield (right=left)
Down-turning point of the rear windshield (right=left)

Chapter X Harness

Section I Battery Negative Harness

I. Harness Sketch



II. Instructions on Main Connectors

No	Connector Name	Pins	Connection	Remark
1	Hole type joint	1	Battery Negative	
2	Vehicle body ground	1	Vehicle body	Below left-front fender

III. Removal and Installation of Battery Harness

Part number: S12-3703010AC

(I). Preparations

Tools: 10#. 13# wrench

(II). Notes

Make sure to disconnect the power supply when disassembling the electrical components and harnesses.
Ignition switch must be OFF.

(III). Removal Steps

1. Removal
1.1. Use a 10# wrench to remove the battery positive.

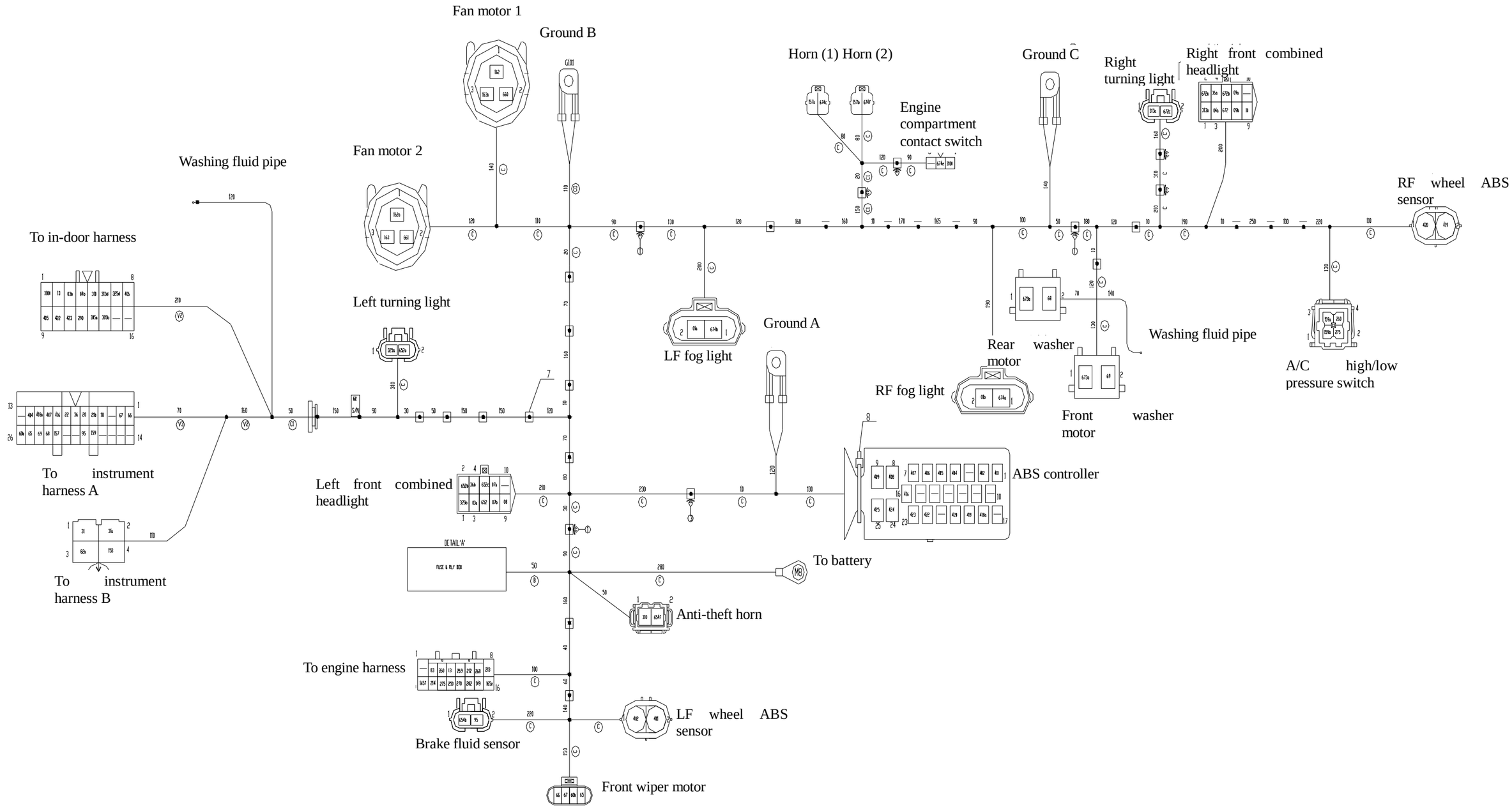
1.2. Use a 10# wrench to loosen off the battery negative.

1.3. Use a 13# wrench to loosen off the battery negative harness
Remove the battery negative harness at the vehicle body ground wire.

2. Installation
The installation steps are reverse to those for removal.

Section II Front Compartment Harness

I. Harness Sketch



II. Instructions on Main Connectors

No	Connector Name	Pins	Connection	Remark
1	In-door harness connector	16	In-door harness	
2	Instrument harness A connector	26	Instrument harness A	
3	Instrument harness B connector	4	Instrument harness B	
4	Washing fluid piping			
5	ABS connector	25	ABS	
6	Ground A		Vehicle body	ABS on the left-front side member
7	Left-front combination headlights connector	10	Left-front combination headlights	
8	Fuse box		Fuse box	
9	Anti-theft speakerconnector	2	Anti-theft speaker	
10	Connect the battery		Battery	
11	Engine harness connector	16	Engine harness	
12	Brake fluid level sensor connector	2	Brake fluid level sensor	
13	Front wiper motor connector	4	Front wiper motor	
14	Left-front wheel ABS sensor connector	2	Left-front wheel ABS sensor	
15	Left turning light connector	2	Left turning light	
16	Fan motor 1 connector	3	Fan motor 1	
17	Fan motor 2 connector	3	Fan motor 2	
18	Ground B		Vehicle body	Fan on the left-front side member
19	Left-front fog lights connector	2	Left-front fog lights	
20	Speaker 1 connector	2	Speaker 1	
21	Speaker 2 connector	2	Speaker 2	
22	Front compartment contact switch connector	3	Front compartment contact switch	
23	Ground C		Vehicle body	Washer solution tank on the right-front side member
24	Right-front fog light connector	2	Left-front fog light	
25	Front washing motor connector	2	Front washing motor	
26	Rear washing motor connector	2	Rear washing motor	
27	Washing fluid pipe			
28	Right turning light connector	2	Left turning light	
29	Right-front combination headlight connector	10	Right-front combination headlight	
30	Right-front wheel ABS sensor connector	2	Right-front wheel ABS sensor	
31	Air-conditioner high/low voltage switch connector	4	Air-conditioner high/low voltage switch	

III. Removal and Installation of Front Compartment Harness

Part number: S12-3724010

(I). Preparations

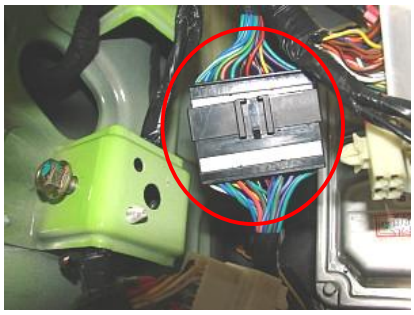
Tools: sleeve wrench, cross head screwdriver, flat head screwdriver

(II). Notes

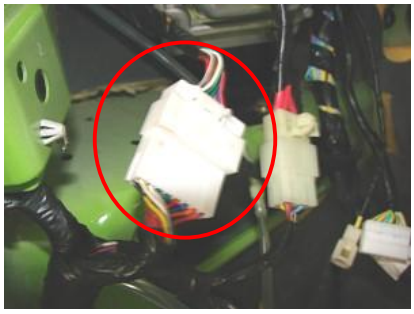
Make sure to disconnect the power supply when disassembling the electrical components and harnesses.
The ignition switch must be OFF.

(III). Removal Steps

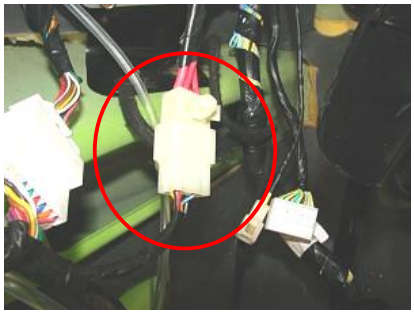
1. Removal
1.1.1. Remove the left-down shield of the Instrument Panel. (See Removal and Installation of Instrument Panel)
1.1.2. Unplug the in-door harness connector.



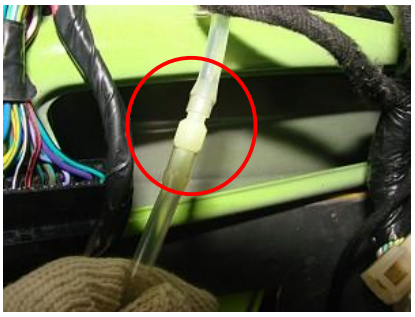
1.1.3. Unplug the connector of instrument harness A.



1.1.4. Unplug the connector of instrument harness B.

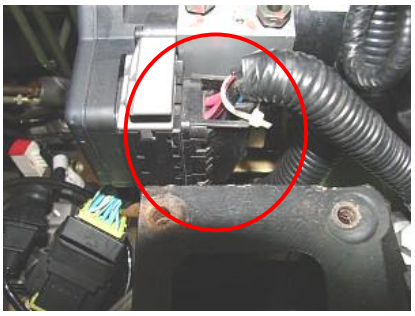


1.1.5. Unplug the washing fluid piping connector.

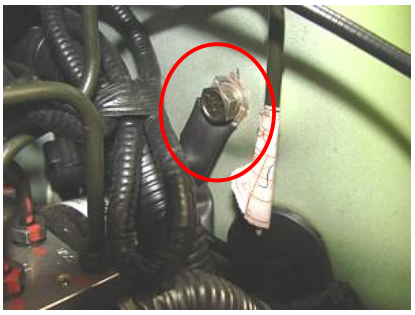


1.1.5. Disassemble the battery. (See Removal and Installtion of Battery).

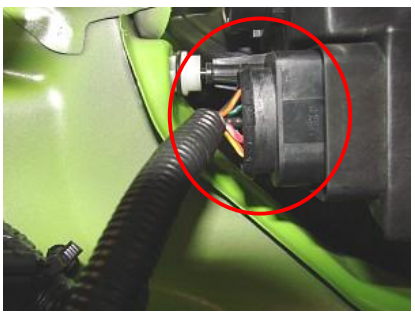
1.1.6. Unplug the ABS plug.



1.1.7. Remove the ground wire. (ABS on left-front side member)



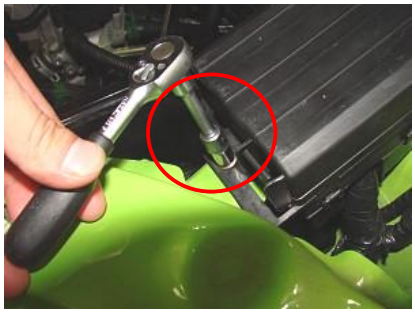
1.1.8. Unplug the connector to left headlight.



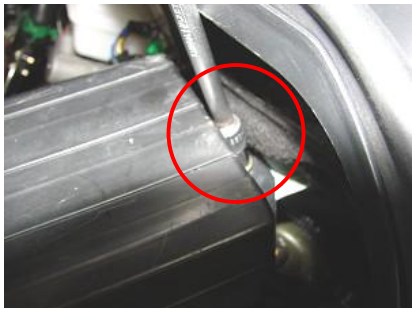
1.1.9. Unplug the connector of left-front fog light.

1.1.10. Unplug the engine harness connector.

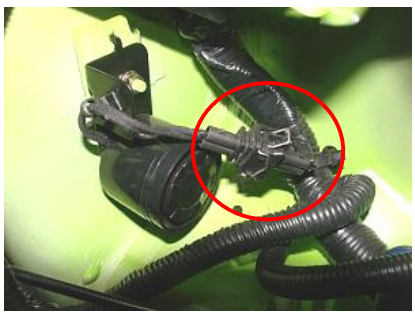
1.1.11. Use a sleeve wrench to loosen off the lower fixing screws of the fuse box.



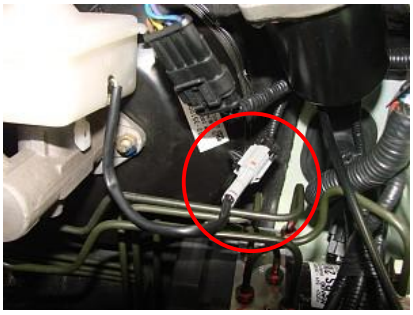
1.1.12. Use a sleeve wrench to loosen off the upper fixing screws of the fuse box.



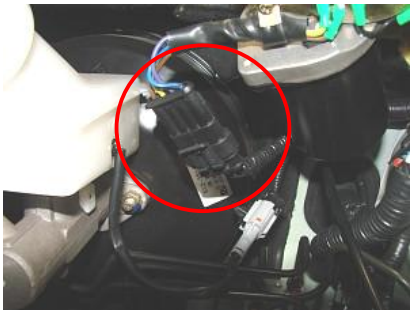
1.1.13. Unplug the connector to the anti-theft speaker.



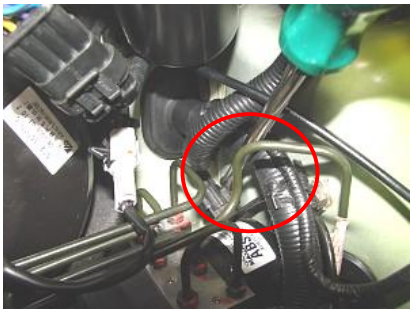
1.1.14. Unplug the connector to the brake fluid level sensor.



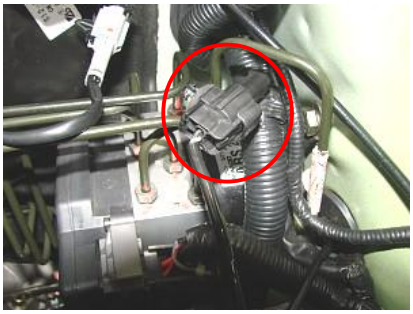
1.1.15. Unplug the connector to the wiper motor



1.1.16. Use a flat head screwdriver to pry out the left-front wheel ABS sensor plug fixed on the vehicle body. (Near ABS)



1.1.17. Unplug the left-front wheel ABS sensor plug.

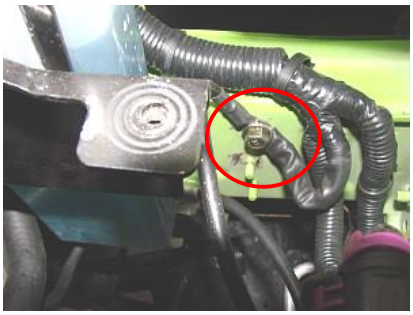


1.1.18. Use a flat head screwdriver to pry open the left-front turning light.

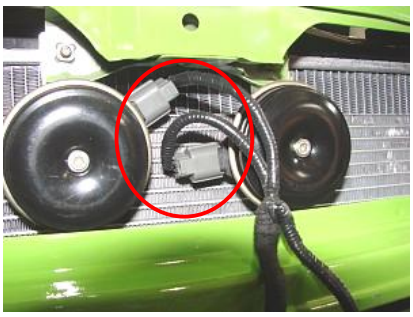
1.1.19. Unplug the plug of the left-front turning light.

1.1.20. Unplug the two connectors of the fan motor.

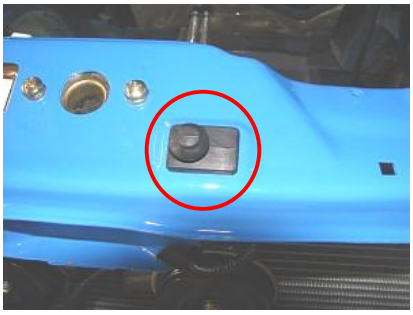
1.1.21. Loosen off the ground wire on the side member. (Fan)



1.1.22. Unplug the two connectors to the speaker.

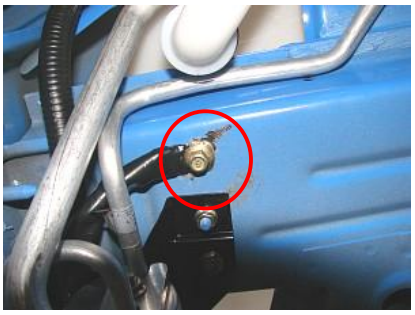


1.1.23. Disassemble the front compartment contact switch.



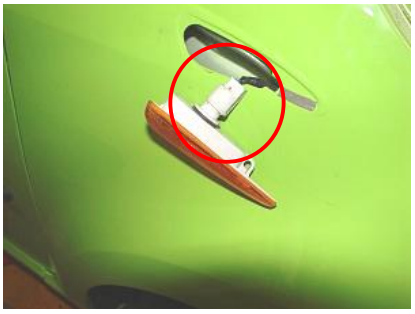
1.1.24. Unplug the connectors of the front/rear washing motors.

1.1.25. Disassemble the ground wire. (Washing fluid tank on the right-front side member)

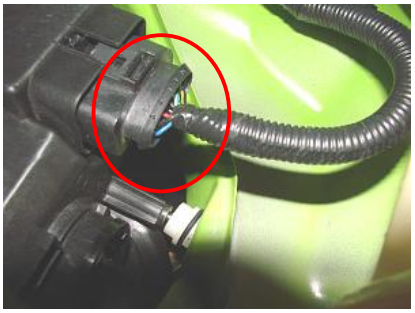


1.1.26. Use a flat head screwdriver to pry open right-front turning light.

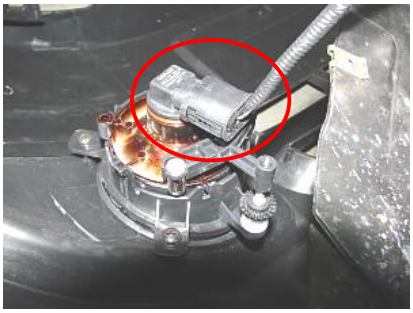
1.1.27. Unplug the plug of the right-front turning light.



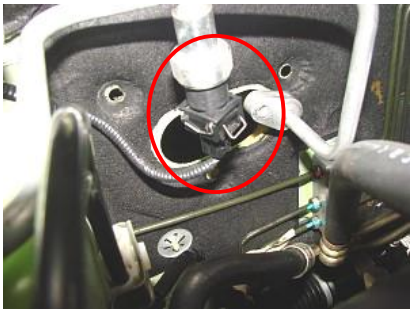
1.1.28. Unplug the right headlight connector.



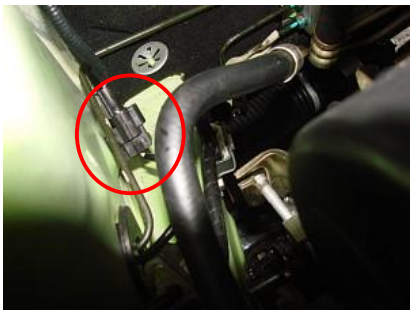
1.1.29. Unplug the right-front fog light connector.



1.1.30. Unplug the high/low voltage switch plug of the air-conditioner.



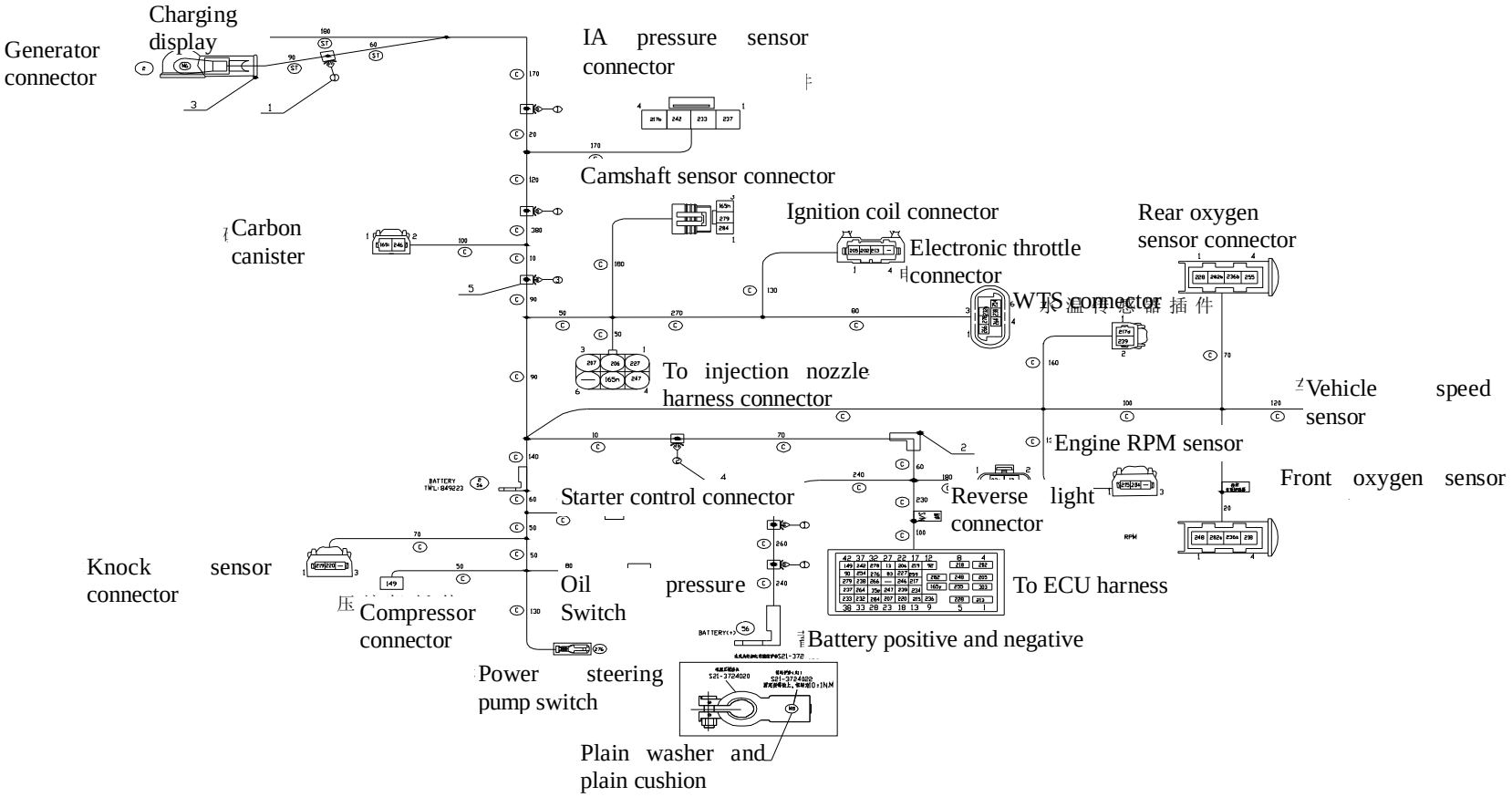
1.1.31. Unplug the right-front wheel ABS sensor plug.



2. Installation
The installation steps are reverse to those for removal.

Section III Removal and Installation of Electronic Fuel Injection Harness

I. Harness Sketch



II. Instructions on Harness Connectors

No	Connector Name	Pins	Connection
1	Recharging display connector	1	Ground
		2	To ECU harness connector
2	Motor connector	1	——
3	Intake pressure sensor	1	To ECU harness connector
		2	To ECU harness connector
		3	To ECU harness connector
		4	Ground
4	Carbon canister solenoid valve connector	1	Ground
		2	To ECU harness connector
5	Camshaft sensor connector	1	To ECU harness connector
		2	To ECU harness connector
		3	Ground
6	Oil nozzle harness connector	1	To ECU harness connector
		2	To ECU harness connector
		3	To ECU harness connector
		4	To ECU harness connector
		5	Ground
		6	——
7	Ignition coil connector	1	To ECU harness connector
		2	To ECU harness connector
		3	To ECU harness connector
		4	——
8	Electronic throttle connector	1	To ECU harness connector
		2	To ECU harness connector
		3	Ground
		4	To ECU harness connector
		5	To ECU harness connector
		6	To ECU harness connector

9	Water thermostat connector	1	Ground
		2	To ECU harness connector
10	Engine rotation speed sensor connector	1	To ECU harness connector
		2	To ECU harness connector
		3	——
11	Rear oxygen sensor connector	1	To ECU harness connector
		2	Ground
		3	Ground
		4	To ECU harness connector
12	Front oxygen sensor connector	1	To ECU harness connector
		2	Ground
		3	Ground
		4	To ECU harness connector
13	Vehicle speed sensor connector	1	To ECU harness connector
		2	To ECU harness connector
		3	To ECU harness connector
14	Starter controller connector	1	To ECU harness connector
15	Knock sensor connector	1	To ECU harness connector
		2	To ECU harness connector
		3	——
16	Oil pressure switch connector	1	To ECU harness connector
17	Compressor connector	1	To ECU harness connector
18	Power steering pump switch connector	1	To ECU harness connector
19	Reverse light switch connector	1	Ground
		2	To ECU harness connector

III. Removal and Installation of Harness

Part number: S12-3724180
Tools: flat head screwdriver, cross head screwdriver, sleeve wrench
Notes:
(1) The ignition switch must be OFF.
(2) When disassembling the electrical components and harnesses, disconnect the power supply.
(3) When disassembling common plugs (connectors), first press down the locking device, and then separate the plug and socket by force. Be careful not to pull at the wires so as not to damage the wires and connectors.

1. Removal Steps

1.1. Removal of battery and air filter.
1.1.1. Disconnect the battery negative.

1.1.2. Loosen off the battery positive and remove the battery assembly.

1.1.3. Use a sleeve wrench to loosen off the air filter fastening nuts.

1.1.4. Use a sleeve wrench to loosen off the inlet air filter fastening nuts.

1.1.5. Pull out the hose that connects the air filter and engine inlet manifold by hand.

1.1.6. Remove the air filter.

1.1.7. Disassemble the battery fixed mounting.

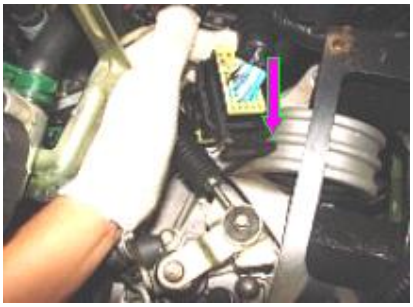
1.2. The installation steps are reverse to those for removal..

2. Removal of harness

2.1. Disassemble the joints of all connectors of the engine harness.

2.1.1. Disassemble the connector that connects the electronic fuel injection harness with the ECU wiring harnes.

The removal can be carried out by pulling out the clip as shown in the figure, and then the connector can be removed.



2.1.2. Disassemble the electronic throttle connector.

2.1.3.The ignition coil connector can be diassembled by pressing at the place shown in the right figure.

2.1.4. Disassemble the camshaft sensor connector.

2.1.5. Disassemble the carbon canister solenoid valve connector.

2.1.6. Disassemble the inlet pressure sensor connector.

2.1.7. Disassemble the recharging display connector.

2.1.8. Disassemble the generator connector.

2.1.9. Disassemble the starter connector.

2.1.10. Unplug the air-conditioning compressor connector.

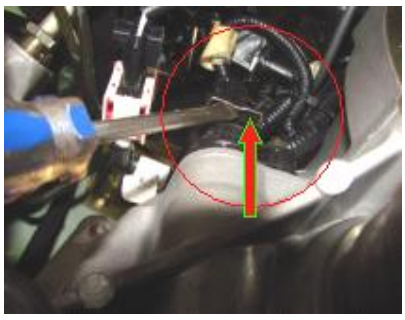
2.1.11. Disassemble the power steering pump connector.

2.1.12. Disassemble the knock sensor connector.

2.1.13. Disassemble the reverse light switch connector.

2.1.14. Disassemble the water thermostat connector.

2.1.15. Disassemble the front/rear oxygen sensor connector. Simply pull out the red lid on the connector as shown in the figure.



2.1.17. Disassemble the vehicle speed sensor connector.
Use a flat head screwdriver to pry open the clips on the connector and then pull it out.

2.1.18. Disassemble the engine rotation speed sensor connector.

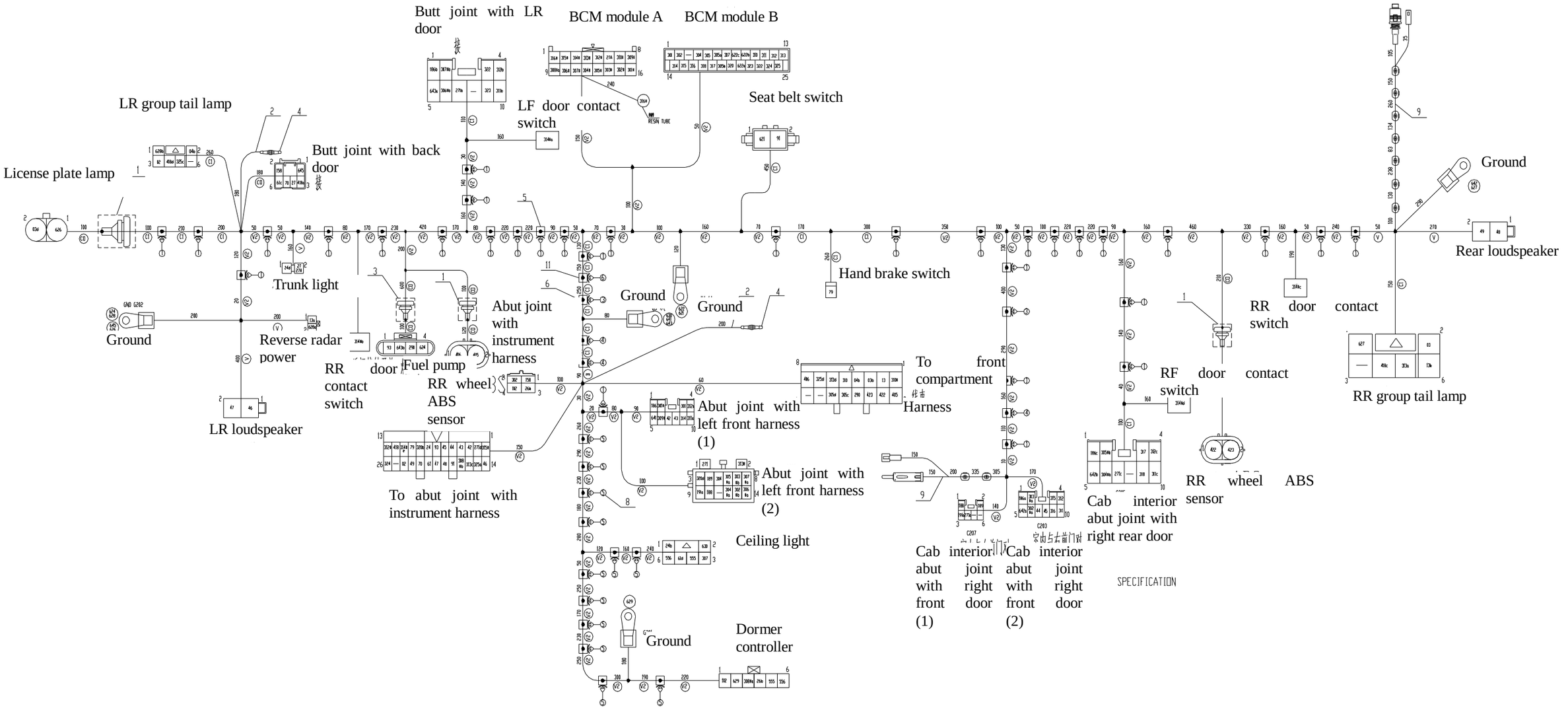
2.1.19. Take out the electronic fuel injection harness assembly.

2. Installation of harness

The installation steps are reverse to those for removal..

Section IV In-door Harness:

I. Harness Sketch



III. Instructions on Main Connectors

No	Connector Name	Pins	Connection	Remark
1	License plate lights connector	2	License plate lights harness	
2	Left-rear combination tail light connector	10	Left-rear combination tail light harness	
3	Trunk light connector	2	Trunk light harness	
4	Left-rear speaker connector	2	Left-rear speaker harness	
5	Fuel pump connector	4	Fuel pump harness	
6	Right-rear speaker connector	2	Right-rear speaker harness	
7	Right-rear combination tail tights connector	6	Right-rear combination tail lights harness	
8	BCM Module A connector BCM Module B connector	16 25	BCM Module A harness BCM Module B harness	
9	Hand brake switch connector	1	Hand brake switch harness	
10	Ceiling light connector	6	Ceiling light harness	
11	Seat belt switch connector	2	Seat belt switch harness	
12	Connect the instrument harness butt joint	26	Butt jointed with instrument harness	
13	Butt jointed with instrument harness	4	Butt jointed with instrument harness	
14	To front compartment harness connector	16	To front compartment harness	
15	Left-rear wheel ABS sensor connector	2	Left-rear wheel ABS sensor harness	
16	Right-rear wheel ABS sensor connector	2	Right-rear wheel ABS sensor harness	
17	Reverse radar power connector	2	Reverse radar power harness	
18	Butt jointed with tail door harness	6	Butt jointed with tail door harness	
19	Ground	1	Connected with ground wire	Inside the left C-pillar inner shield
20	Left-rear door contact switch connector	1	Left-rear door contact switch harness	
21	Right-rear door contact switch connector	1	Right-rear door contact switch harness	
22	Ground	1	Connected with ground wire	Inside the right C-pillar inner shield
23	Connector to front door harness butt joint 1	10	Front door harness butt joint 1	
24	Connector to front door harness butt joint 2	14	Front door harness butt joint 2	
25	Connector to interior and right-front door butt joint 1	6	Interior and right-front door butt joint 1	
26	Connector to interior and right-front door butt joint 2	10	Interior and right-front door butt joint 2	
27	Right-front door contact switch connector	1	Right-front door contact switch harness	
28	Left-front door contact switch connector	1	Left-front door contact switch harness	
29	Forming butt-joint with left-rear door harness	10	Forming butt-joint with left-rear door harness	
30	Interior forming butt-joint with right-rear door	10	Interior forming butt-joint with right-rear door	
31	Ground	1	Connected with ground wire	In the carpet under below left A-pillar
32	Ground	1	Connected with ground wire	On the left of BCM module box
33	Ground	1	Connected with ground wire	In the left ceiling handle
34	Dormer controllerconnector	6	Sunroof controller harness	

III. Removal and Installation of In-door harness

Part number: S12-3724050

(I). Preparations

Tools: sleeve wrench, cross head screwdriver, flat head screwdriver

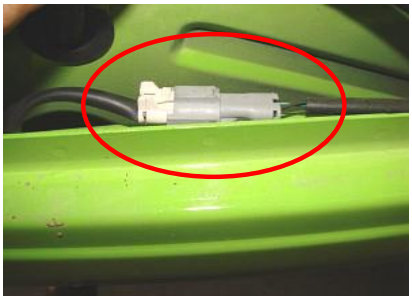
(II). Notes

When disassembling the electrical components and harness, make sure to disconnect the power supply.
The ignition switch must be OFF.

(III). Removal Steps

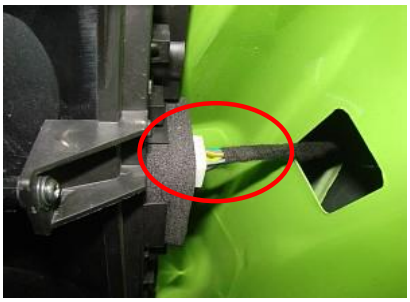
1. Removal of license plate light harness.

1.1. Disassemble the rear bumper assembly. (See Removal and Installation of Rear Bumper)
1.2. Unplug the plug of the license plate light harness.



2. Removal of left-rear group tail Llights harness

2.1. Disassemble the left-rear group tail lights assembly. (See Removal and Installation of Left-rear Combination Tail Lights)
2.2. Unplug the plug of the left-rear combination tail lights harness.



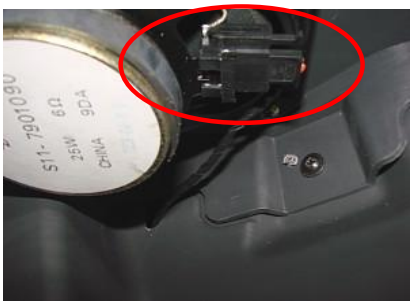
3. Use a flat head screwdriver to pry off the luggage light, and unplug the luggage light harness.

4. Unplug the plug of the left-rear speaker harness.

5. Removal of fuel pump harness.

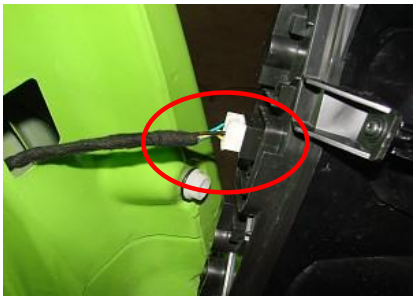
5.1. Pull off the right-rear seat, and take down the plastic cover on the fuel pump.
5.2. Unplug the fuel pump harness plug.

6. Unplug right-rear speaker harness plug.



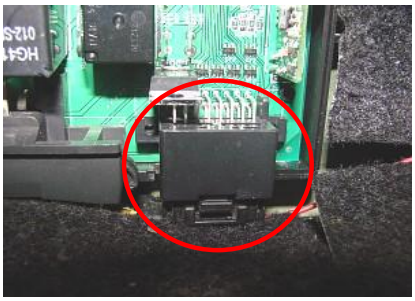
7. Disassemble the right-rear combination tail light harness.

7.1. Disassemble right-rear combination tail lights assembly. (See Removal and Installation of Right-rear Combination Tail Lights)
7.2. Unplug the right-rear combination tail lights harness plug.

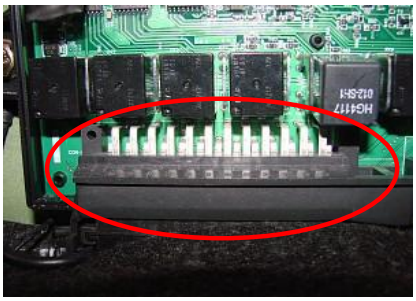


8. Removal of BCM MODULE.

8 . 1 . Open BCM module box.
8 . 2 . Unplug the BCM module A plug.



8 . 3 . Unplug the BCM Module B plug.

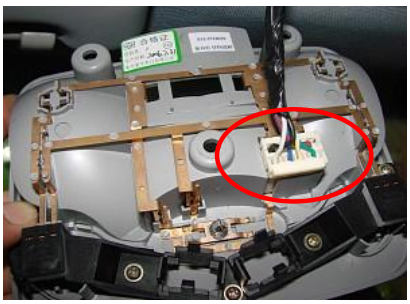


9 . Removal of hand brake harness

9 . 1 . Disassemble the auxiliary Instrument Panel assembly. (See Removal and Instalaltion of Auxiliary Instrument Panel)
9 . 2 . Unplug the hand brake harness plug.

10. Removal of ceiling light harness.

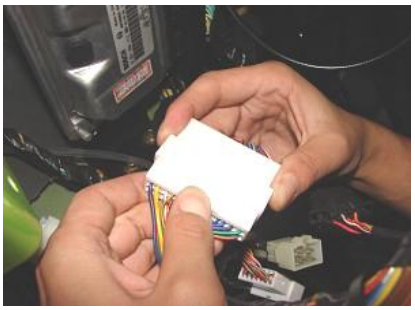
10. 1 . Disassemble the ceiling light. (See Removal and Installation of Ceiling Light)
10. 2 . Unplug the ceiling light harness plug.



11. Unplug the seat belt switch harness plug.

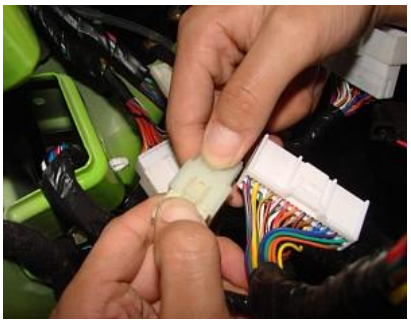
12. Removal of instrument harness butt joint

12. 1 . Disassemble the Instrument Panel. (See Removal and Installation of Instrument Panel)
12. 2 . Unplug the instrument harness butt joint.



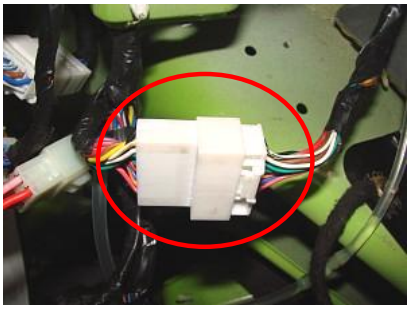
13. Removal of instrument harness butt joint

13. 1 . Disassemble the Instrument Panel. (See Removal and Installation of Instrument Panel)
13. 2 . Unplug the instrument harness butt joint.



14. Removal of front compartment harness connector.

14. 1 . Disassemble the Instrument Panel. (See Removal and Installation of Instrument Panel)
14. 2 . Unplug the front compartment harness plug.



15. Removal of left-rear wheel ABS sensor harness

15.1. Raise the vehicle by hoister. (Take care of your safety)
15.2. Unplug the left-rear wheel ABS sensor connector.

16. Removal of right-rear wheel ABS sensor harness.

16.1. Raise the vehicle by hoister. (Take care of your safety)
16.2. Unplug the right-rear wheel ABS sensor connector.

17. Removal of reverse radar power harness

17.1. Use a cross head screwdriver to remove the left C-pillar inner shield.

17.2. Unplug the reverse radar power plug.

18. Removal of the tail door harness' butt jointed harness.

18.1. Disassemble the left C-pillar inner shield.

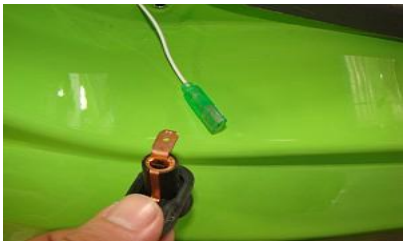
18.2. Unplug the tail door harness' butt jointed harness.

19. Disassemble the ground.

20. Removal of right-rear door contact switch harness

20.1. Open the right-rear door and disassemble the crews that fix the contact switch with a cross head screwdriver, and then take off the right-rear door contact switch.

20.2. Unplug the right-rear door contact switch plug.

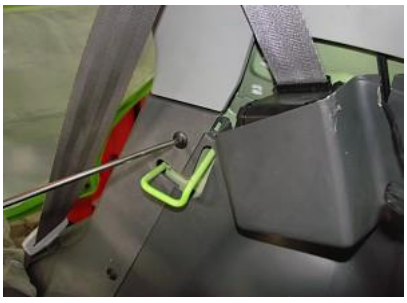


21. Removal and removal of left-rear door contact switch harness

21.1. Open the left-rear door and disassemble the crews that fix the contact switch with a cross head screwdriver, and then remove left-rear door contact switch.

21.2. Unplug the left-rear door contact switch plug.

22. Disassemble the rigth C-pillar inner shield and then disassemble the ground wire.



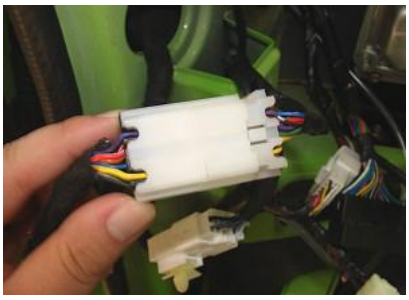
23. Removal of left-front door harness butt joint 1.

23.1. Disassemble the left A-pillar inner shield, and push down the plastic lock that fixed the connector of the left-front door harness butt joint 1. (See Removal of A-pillar inner shield)
23.2. Unplug the plug of the left-front door harness butt joint 1.

24. Removal of the left-front door harness butt joint 2.

24.1. Disassemble the left A-pillar inner shield, push down the plastic lock that fixes the connector of left-front door harness butt joint 2. (See Removal of A-pillar Inner Shield)

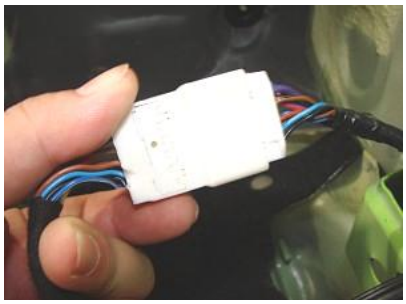
24.2. Unplug the plug of left-front door harness butt joint 2.



25. Removal of interior and right-front door butt joint 1.

25.1. Disassemble the right A-pillar inner shield, and push down the plastic lock that fixes the right-front door harness butt joint 2. (See Removal of A-pillar Inner Shield)
25.2. Unplug the plug of right-front Door harness butt joint 1.

26. Removal of interior and right-front door butt joint 2.



26.1. Disassemble the right A-pillar inner shield, push down the connector plastic lock that fixes the right-front door harness butt joint 2. (See Removal of A-pillar Inner Shield).
26.2. Unplug the plug of Right-front Door harness butt joint 1.

27. Removal of right-front door contact switch harness.

27.1. Use a cross head screwdriver to loosen off the screws that fix the right-front door contact switch, and then remove the right-front door contact switch.

27.2. Unplug the right-front door contact switch plug.

28. Removal of left-front door contact switch harness.

28.1. Use a cross head screwdriver to loosen off the screws that fixes the left-front door contact switch, and then remove the left-front door contact switch.

28.2. Unplug the left-front door contact switch plug.

29. Removal of the harness butt jointed with the left-rear door harness.

29.1. Disassemble the left B-pillar inner shield. (See Removal and Installation of B-pillar Inner Shield)
29.2. Push down the plastic clips that fixes the harness connector butt jointed left-rear door harness, and then unplug the harness plug that butt joints the left-rear door harness.

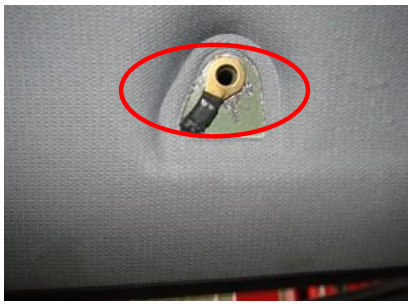
30. Removal of the Interior and right-rear door butt jointed harness

30.1. Disassemble the right B-pillar inner shield. (See Removal and Installation of B-pillar Inner Shield)
30.2. Unplug the harness plug butt jointed with the interior and right-rear door.

31. Disassemble the ground wire.

32. Disassemble the screws that fix the BCM module, and then disassemble the ground wire.

33. Use a cross head screwdriver to remove the left vehicle ceiling handle, and then disassemble the ground wire.



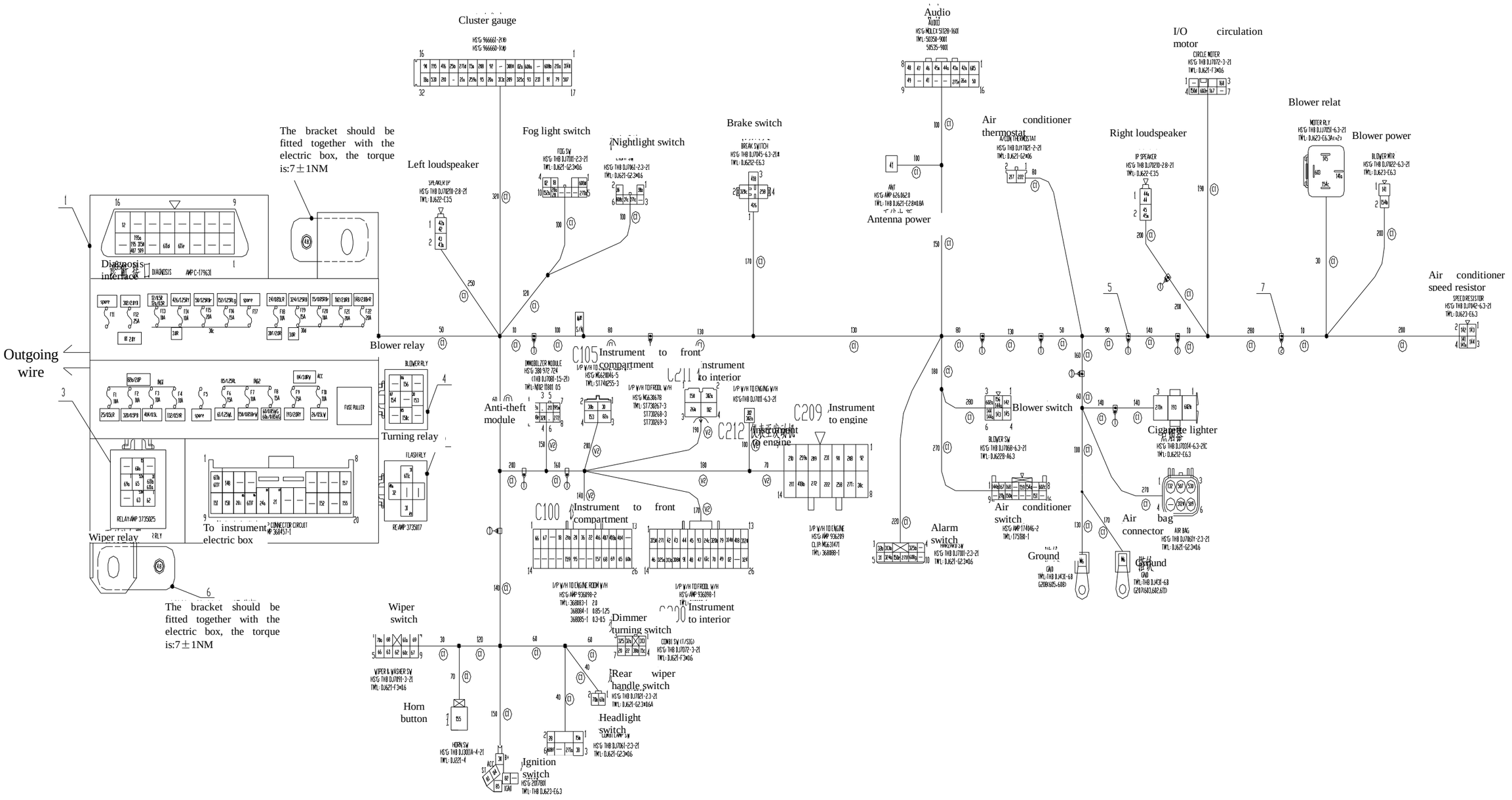
34. Removal of sunroof controller harness.

34.1. Disassemble the left vehicle ceiling. (See Removal and Installation of Vehicle Ceiling)
34.2. Remove the sunroof controller harness plug.
(Note: Optional for some vehicle types and the sunroof controller connectors are reserved for this vehicle type.)

35. Installation of In-door harness. (The steps are reverse to those for removal)

Section V Removal and Installation of Instrument Panel Harness

I. Harness sketch



II. Instructions on Main Connectors

No	Connector Name	Pins	Connection
1	Combination instrument connector	1	Instrument to interior
		2	Anti-sheft module →instrument to engine
		3	Ground
		4	——
		5	Ground
		6	Fog lights →c200 (instrument to interior)
		7	C200 (instrument to interior)
		8	——
		9	C209 (instrument to engine)
		10	C209 (instrument to engine)
		11	Instrument electric box
		12	Instrument to interior (c200)
		13	Ignition switch (IGN1)
		14	C100 (instrument to front compartment)
		15	Trouble diagnosis socket
		16	C209 (instrument to engine)
		17	Air bag
		18	C209 (instrument to engine)
		19	C200 (instrument to interior)
		20	C209〔instrument to engine〕
		21	C200 〔instrument to interior 〕
		22	Headlight switch
		23	C209 (instrument to engine)
		24	Headlight switch
		25	C100〔instrument to front compartment 〕
		26	C100〔instrument to front compartment
		27	C209〔instrument to engine〕
		28	Instrument electric box
		29	——
		30	C209〔instrument to engine〕
		31	Air bag
		32	Fog lights switch →instrument to front compartment
2	Left loudspeaker connector	1	Audio system C200 (instrument to interior)
			C200(instrument to interior) Audio system
3	Fog light switch connector	1	Ground
		2	——
		3	C100 〔instrument to front compartment〕
		4	C200(instrument to interior)
		5	C200 (instrument to interior)
		6	——
		7	——
		8	——
		9	Headlight switch Instrument electric box

		10	Instrument electric box connector → instrument electric box
4	Nightlight switch connector	1	Headlight switch
		2	C100 〔instrument to front compartment 〕
		3	——
		4	C200 (instrument to interior)
		5	Instrument electric box
		6	Ground
5	Brake light switch connector	1	Instrument electric box
		2	Ignition switch (IGN1)
		3	C200 (instrument to interior)
		4	C209〔instrument to engine〕
6	Audio system connector	1	Ground
		2	C200 instrument to interior
		3	Speaker
		4	Speaker
		5	Speaker
		6	Speaker
		7	C200 (instrument to interior)
		8	C200 (instrument to interior)
		9	C200 (instrument to interior)
		10	——
		11	ANT
		13	——
		14	——
		15	C200 (instrument to interior)
		16	C200 (instrument to interior)
7	Antenna power connector	1	ANT
8	Air-conditioner thermostat connector	1	C209 〔instrument to engine〕
		2	C209 〔instrument to engine〕
9	Right loudspeaker connector	1	Audio system C200 (instrument to interior)
		2	C200 (instrument to interior) Audio system

10	Inside/outside motor connector	1	——
		2	——
		3	A/C switch
		4	Ignition switch (IGN2)
		5	Ground
		6	A/c switch
		7	——
11	Blower relay connector	1	Ground
		2	Blower switch
		3	Speaker resistor
		4	Ground
12	Blower power supply connector	1	Air-conditioner reconditionang
		2	Blower relay
13	Air-conditioner reconditionang connector	1	Blower switch
		2	Blower switch
		3	Blower switch
		4	Blower power supply Blower relay connector
14	C105 instrument to front compartment connector	1	Ignition switch
		2	Ignition switch
		3	Ignition switch
		4	Blower relay
15	C100 instrument to front compartment connector	1	Windshield washing switch
		2	Windshield washing switch
		3	——
		4	Fog light switch
		5	To Instrument electric box connector
		6	Headlight switch
		7	Nightlight switch
		8	Headlight switch
		9	Instrument panel plug
		10	Trouble diagnosis socket
		11	Brake light switch
		12	Ignition switch(IGN1)
		13	——
		14	——
		15	——
		16	——
		17	——
		18	A\C switch
		19	——Instrument panel connector
		20	——
		21	——

		22	To instrument electric box connector
		23	Wiper switch
		24	Wiper switch
		25	Wiper switch
		26	Ignition switch(IGN1)
16	C211 instrument to interior connector	1	To instrument electric box connector
		2	C212 instrument to engine
		3	Ignition switch(acc)
		4	Instrument electric box
17	C200 instrument to front compartment connector	1	Trouble diagnosis socket
		2	Ground
		3	Left loud speaker
		4	Left loud speaker
		5	Right loud speaker
		6	Right loud speaker
		7	Instrument panel plug
		8	Instrument panel electric box
		9	Ignition switch(IGN1)
		10	Instrument panel plug
		11	Instrument panel plug
		12	Brake light switch
		13	Air bag
		14	Audio system
		15	Light group switch
		16	Light group switch
		17	Instrument panel plug
		18	Instrument panel plug
		19	Audio system
		20	Audio system
		21	Ignition switch(IGN2)
		22	Wiper switch
		23	Audio system
		24	Fog light switch
		25	——
		26	Alarm switch

18	C212 instrument to engine connector	1	Instrument electric device box C211
19	C209 instrument to engine connector	1	Instrument panel to plug
		2	Instrument panel to plug
		3	Instrument panel to plug
		4	Instrument panel to plug
		5	Instrument panel to plug
		6	Instrument panel to plug
		7	Instrument panel to plug
		8	Headlight switch
		9	Nightlight switch
		10	Brake light switch
		11	Air-conditioner thermostat
		12	Air-conditioner thermostat
		13	Brake light switch
		14	Anti-sheft module
20	Anti-sheft module connector	1	Instrument electric device box
		2	Ground
		3	——
		4	Ignition switch(IGN1)
		5	C209〔instrument to engine〕
		6	——
		7	Failure diagnosis socket → instrument panel plug
		8	C20〔instrument to engine〕
21	Wiper switch connector	1	C200 (instrument to interior)
		2	C100 (instrument to front compartment)
		3	Ignition switch(IGN2)
		4	C100 (instrument to front compartment)
		5	C100(instrument to front compartment)
		6	Wiper relay
		7	Wiper relay
		8	Ignition switch(IGN2)
		9	C100 instrument to front compartment

22	Speaker button	1	Instrument electric box
23	Ignition switch connector	1	C100 (instrument to front compartment)
		2	Instrument electric box
		3	Ground
		4	(ACC) auxiliary electrical equipment bus
		5	Ignition switch(IGN2)
24	Headlights switch connector	1	Instrument electric box
		2	Fog light switch
		3	Ground
		4	C200 (instrument to interior)
		5	——
		6	Ground
25	Rear wiper handle switch connector	1	Ignition switch(IGN2)
		2	C200 (instrument to interior)
26	Dimmer steering switch connector	1	Ground
		2	Steering relay
		3	Ground
		4	Instrument electric box
		5	Ground
		6	C100 (instrument to front compartment)
		7	C100(instrument to front compartment)
27	Alarm switch connector	1	Steering relay
		2	Dimmer steering switch connector
		3	Dimmer steering switch connector
		4	——
		5	Steering relay
		6	Instrument electric box
		7	Ignition switch(IGN2)
		8	C200 (instrument to interior)
		9	Ground
		10	——
28	Blower switch connector	1	Air-conditioner reconditionang
		2	Blower relay
		3	Ground
		4	Blower relay
		5	Air-conditioner reconditionang
		6	Air-conditioner reconditionang

29	Air-conditioner switch connector	1	Blower switch → air-conditioner reconditionang
		2	Inside/outside circulation motor
		3	Inside/outside circulation motor
		4	——
		5	C100(instrument to front compartment)
		6	Blower relay
		7	——
		8	Ground
		9	——
		10	C200 (instrument to interior)
		11	Ignition switch(IGN2)
		12	——
		13	——
		14	——
		15	To instrument electric box
		16	——
30	Cigar lighter	1	Ground wire
		2	Ignition switch(ACC)
		3	C200 (instrument to interior)
31	Air bag connector	1	Ignition switch(IGN1)
		2	Instrument panel plug
		3	Instrument panel plug
		4	——
		5	C200(instrument to interior)
		6	Trouble diagnosis socket
32	Trouble diagnosis socket	1	——
		2	——
		3	——
		4	Ground
		5	Ground
		6	——
		7	Anti-sheft module connector Instrument panel plug C200(instrument to interior) C100(instrument to front compartment) Air bag
		8	——
		9	——
		10	——
		11	——
		12	——
		13	——

		14	——
		15	——
		16	Instrument electric box
33	Wiper relay	1	——
		2	
		3	——
		4	
		5	
		6	
		7	——
		8	
		9	
34	To instrument electric box connector	1	Wiper relay
		2	Instrument electric box
		3	——
		4	——
		5	——
		6	——
		7	——
		8	C100 (instrument to front compartment)
		9	Air-conditioner temperature switch connector
		10	C211 (instrument to interior)
		11	Fog lights switch connector Ignition switch (IGN2)
		12	——
		13	Instrument electric box C105(instrument to front compartment)
		14	Ground
		15	——
		16	——
		17	——
		18	Instrument electric box
		19	——
		20	Speaker button

35	Blower relay	1	——
		2	Blower switch
		3	——
		4	Ground
		5	——
		6	C105 (instrument to front compartment)
		7	——
		8	Ignition switch(IGN2)
		9	——
36	Steering relay	1	Ground Alarm switch
		2	Ground
		3	——
		4	——
		5	Alarm switch Audio system→C200 (instrument to interior)

III. Removal and Installation of Instrument Panel Harness

(I). Preparation of Tools

Tools: 10＃/13＃sleeve wrench, cross head screwdriver, flat head screwdriver

(II). Notes

(1) When disassembling the electrical components and harness, the power supply should be disconnected.
(2) Make sure the ignition switch is OFF.
(3) When disassembling common connectors, push down the latch device on the connector, and then separate the plug from the socket by force, but do not pull at the wires so as not to damage the wires and connectors.

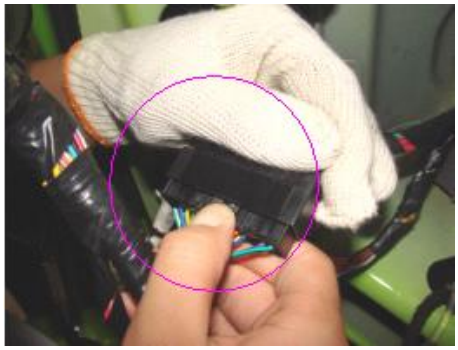
(III). Removal and installation of instrument panel harness

1.1. Removal of Instrument harness
1.1.1. Disassemle the auxiliary instrument panel, and when disassembling the instrument panel, the cigarette lighter connector, blower switch connector, air-conditioner switch connector, air-conditioner thermostat connector, audio system connector, antenna power supply plug, alarm switch connector and safety airbag socket will also be disassembled.. The safety airbag socket is a reserved function, and there are 2 grounds under the console, which can be disaasembled with a 10# sleeve. See Removal of Instrument Panel for detailed removal methods.

1.1.2. Removal of the steering wheel will also involve removal of speaker button connector, wiper switch connector, dimmer steering switch connector, rear wiper switch connector, headlight switch connector, ignition switch connector, nightlight switch connector and fog light switch connector. See Removal of Instrument Panel for detailed removal methods.

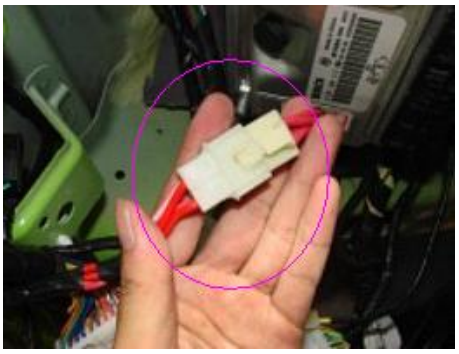
1.1.3. When disassembling the combination instrument, please disassemble the harness plug connectede with the combination instrument. See Removal of Instrument Panel for detailed removal methods.

1.1.4. Unplug the left-right loudspeaker and the brake switch connector.

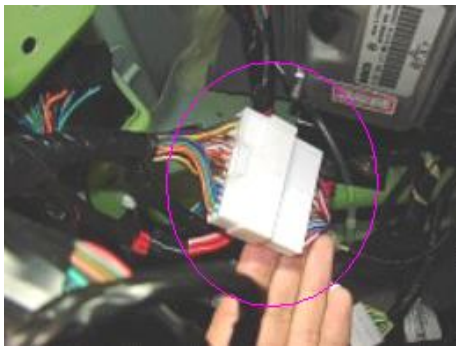


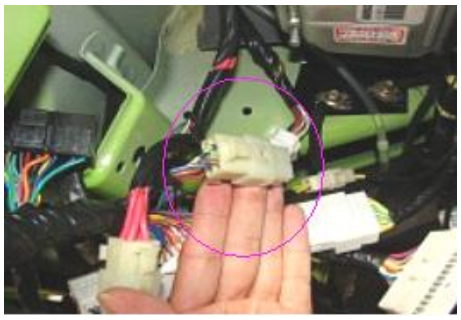
1.1.5. When disassembling the instrument panel crossbeam, please disassemble the inside/outside circulation motor connector of the air-conditioner evaporator, blower power supply connector, blower relay connector, air-conditioner reconditionang connector and anti-theft module connector. See Removal of Evaporator for detailed removal methods.

1.1.6. Disassemble the two connectors of the instrument harness and the front compartment harness, as shown in the right figures:

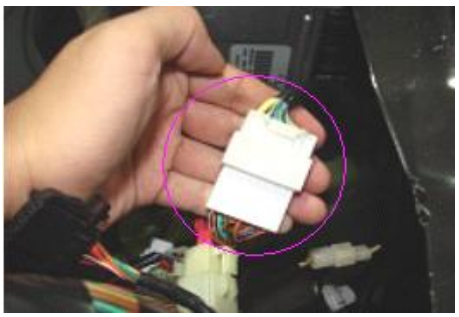


1.1.7. Disassemble the two connectors of the instrument harness and the interior floor harness, as shown in the right figures:

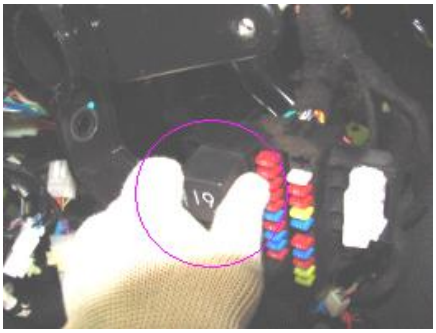




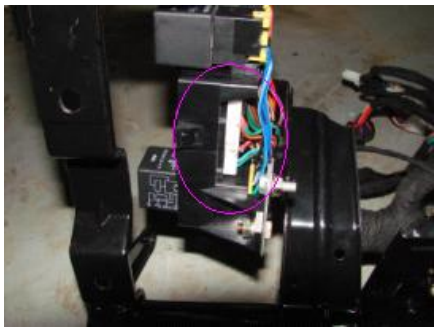
1.1.8. Disassemble the two connectors of the instrument harness and the engine wiring harnes, as shown in the right figures:



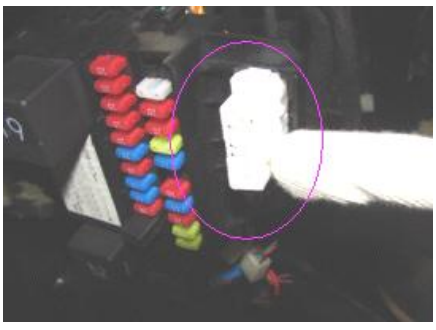
1.1.9. Unplug the blower relay, steering relay, and wiper relay, as shown in the right figures:



1.1.10. Unplug the instrument electric box connector as shown in the right figures:



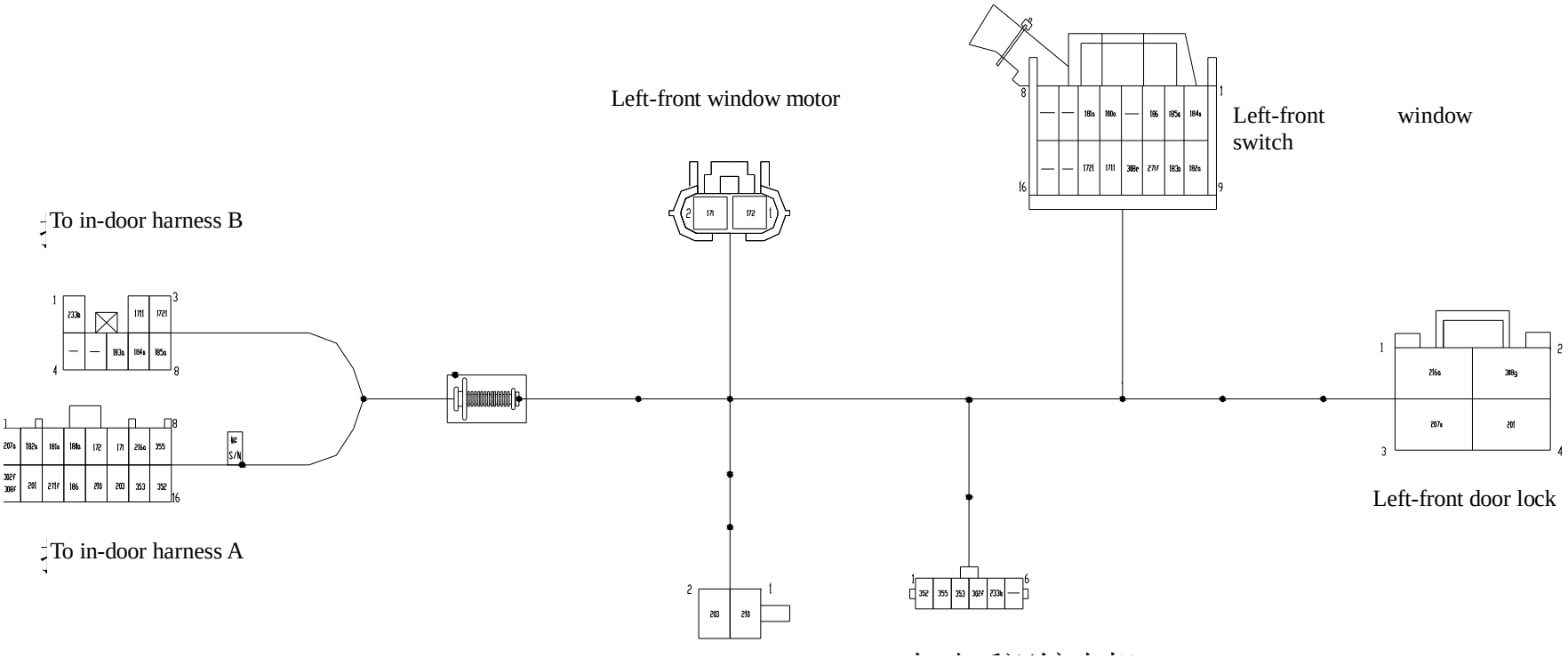
1.1.11. Here is the failure diagnosis socket.



2. Installation of instrument panel harness
The installation steps are reverse to those for removal

Section VI Left-front Door Harness

I. Harness Sketch



II. Instructions on Main Connectors

No	Connector Name	Pins	Connection	Remark
1	To in-door harness B connector	10	In-door harness B	
2	Left-front window motor connector	2	Left-front window motor	
3	Left-front window switch connector	16	Left-front window switch	
4	To in-door harness A connector	14	In-door harnessA	
5	Left-front speaker connector	2	Left/front speaker	
6	Power rearview mirror /left turning light connector	3	Power rearview mirror /left turning light	
7	Left-front door lock connector	4	Left-front door lock	
8	Left-front door remote control connector	2	Left-front door lock	

III. Removal and Installation of Left-front door in-door harness

Part number: S21-3724070

(I). Preparations

Tools: sleeve wrench, cross head screwdriver, flat head screwdriver

(II). Notes

When disassembling the electrical components and harness, please disconnect the power supply.
The ignition switch must be OFF.

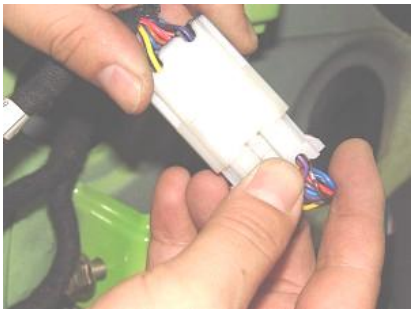
(III). Removal Steps

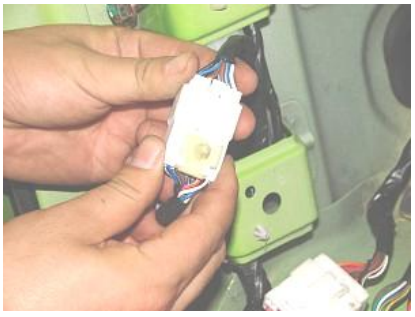
1. Removal
1.1. Disassemble inside door shield. (See Removal of Inside Door Shield)
1.2. Remove the inside door protecting film.
1.3 Unplug the left-front door remote control connector.

1.4. Unplug the door lock connector. (See Removal of Door Lock)
1.5. Unplug the outside left-front door rearview mirror harness connector.

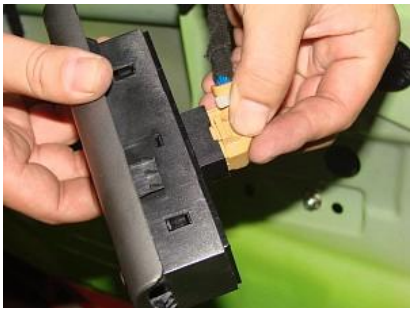
1.6. Unplug the left-front door speaker connector.

1.7. Unplug the two connectors that connect the left-front door in-door harness and interior floor harness. (See Removal of In-door harness)





1.8. Unplug the left-front window switch connector.



19. Unplug the left-front door lock connector.

2.0. Unplug the elevating motor connector.

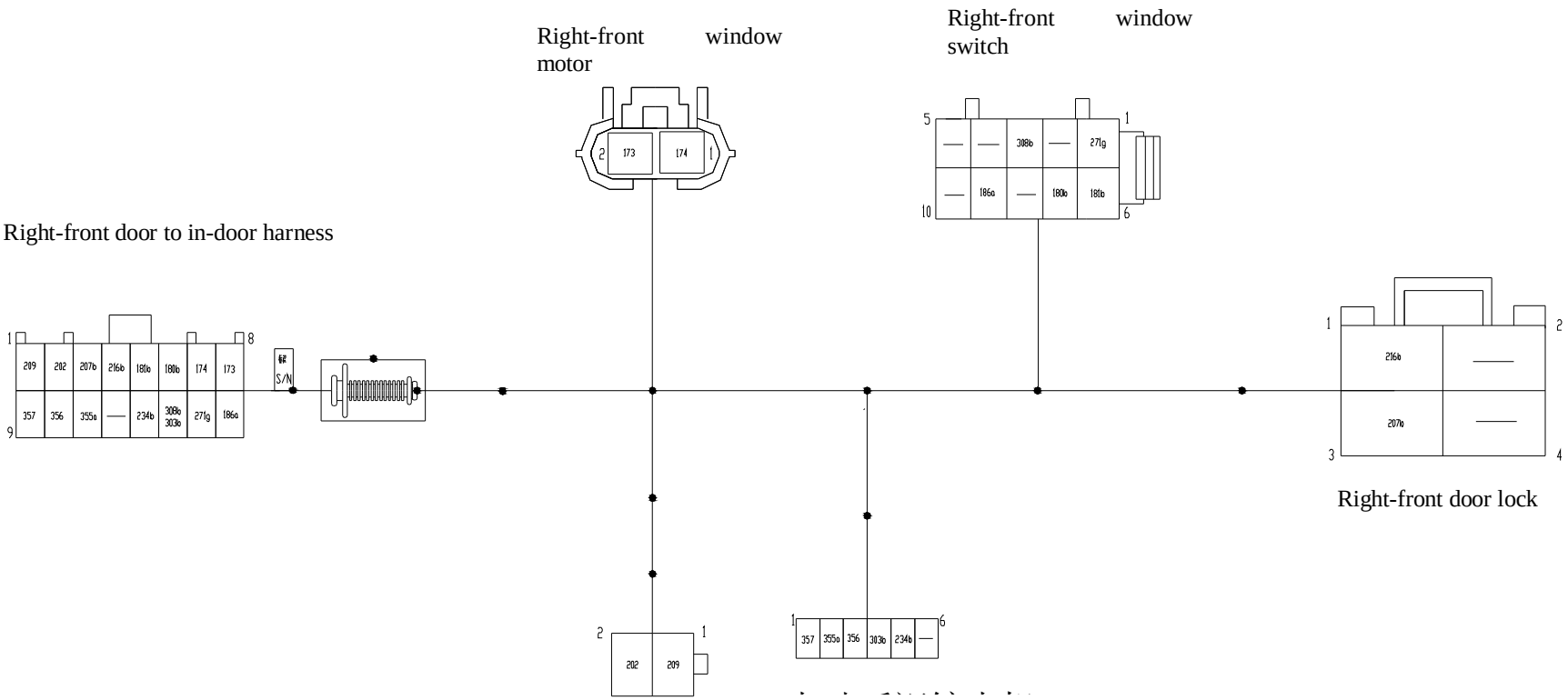
21. Unplug the inside door harness shield, and then remove the harness.

2. Installation.

The installation steps are reverse to those for removal..

Section VII Right-front Door Harness

I. Harness Sketch



II. Instructions on Main Connectors

No	Connector Name	Pins	Connection	Remark
1	Right-front door in-door harness connector	16	In-door harness	
2	Right-front window motor connector	2	Right-front window motor	
3	Right-front window switch connector	10	Right front window switch	
4	Right-front door lock connector	4	Right-front door lock	
5	Right-front speaker connector	2	Right-front speaker	
6	Power rearview mirror motor / right turning light connector	6	Power rearview mirror motor / right turning light	

III. Removal and Installation of Right-front Door In-door Harness

Part number: S21-3724080

1. Removal

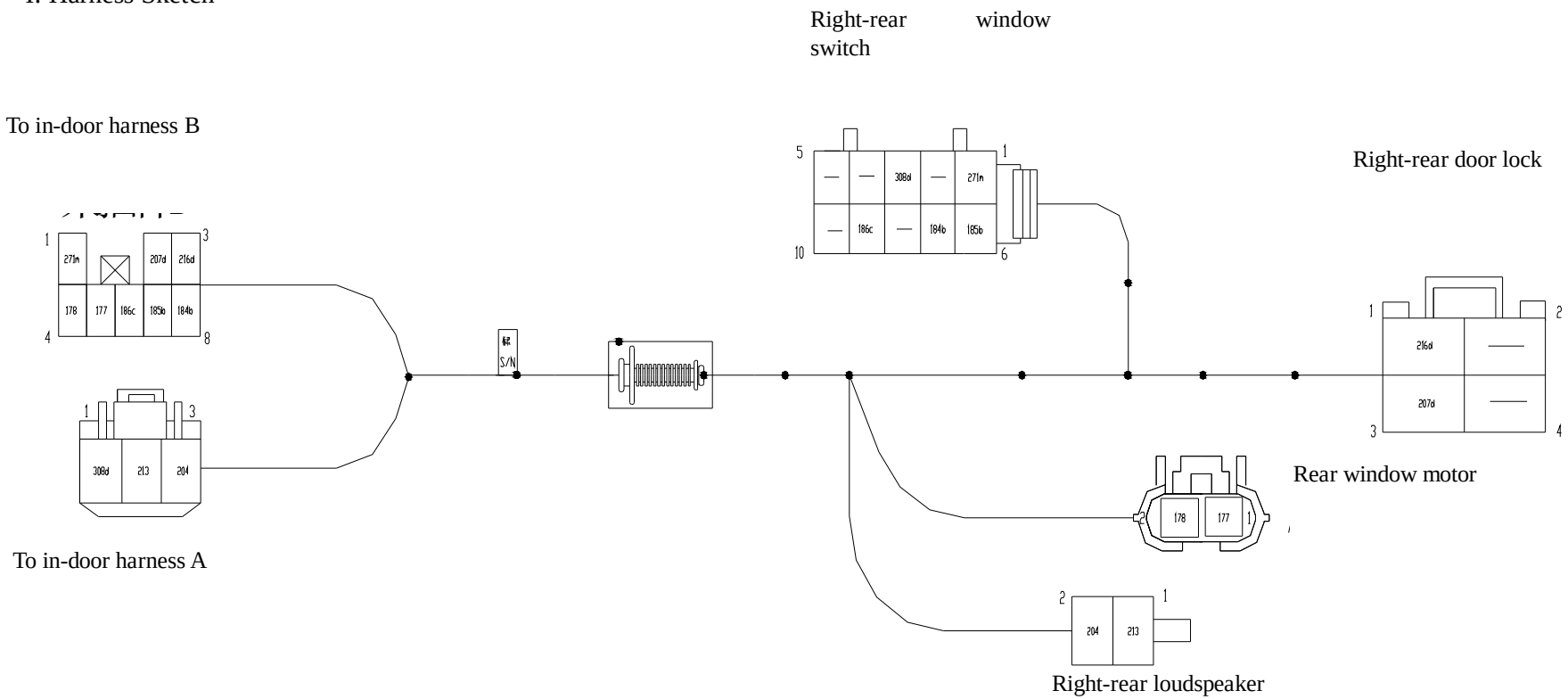
See Removal of Left-front Door In-door harness.

2. Installation

The installation steps are reverse to those for removal.

Section VIII Rear Door Harness

I. Harness Sketch



II. Instructions on Main Connectors

No	Connector Name	Pins	Connection	Remark
1	Right-rear window switch connector	10	Right-rear window switch	
2	Right-rear door lock connector	4	Right-rear door lock	
3	To in-door harness connector A	10	In-door harness A	
4	Rear window motor connector	2	Rear window motor	

III. Removal and Installation of Right-rear Door In-door Harness

Part number: S21-3724180

(I). Preparations

Tools: sleeve wrench, cross head screwdriver, flat head screwdriver

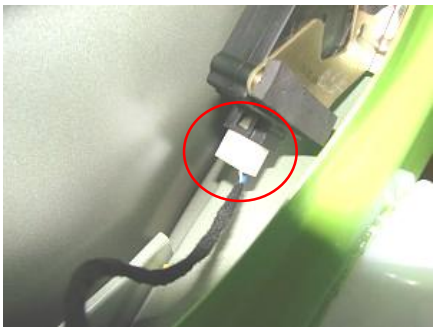
(II). Notes

When disassembling the electrical components and harness, please disconnect the power supply.
The ignition switch must be OFF.

(III). Removal Steps

1. Removal
1.1. Disassemble the rear inside door shield. (See Removal of Inside Door Shield)
1.2. And then remove the inside left-rear door protecting film.
1.3. Unplug right-rear window connector.

1.4. Unplug the door lock harness connector.



1.5. Unplug the elevating motor connector.

1.5. Disassemble the lower-right B-pillar shield. (See Removal and Installation of Door Shield)
1.6. Unplug the connector that connects the inside door harness and in-door harness.

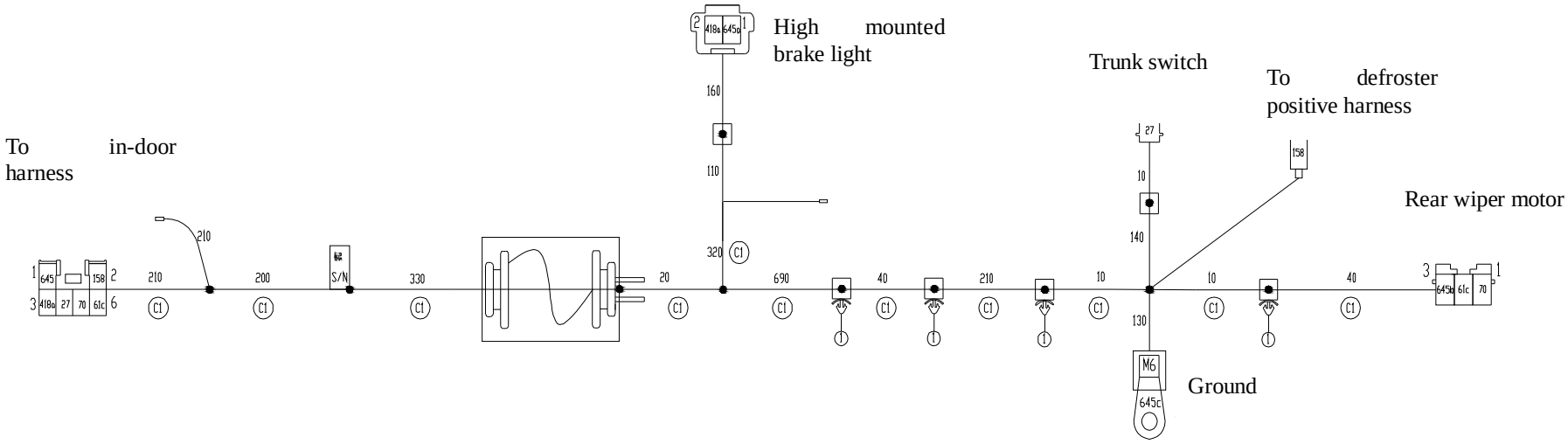
1.7. Unplug door contact switch connector.

1.8. Pull out the inside door harness protective rubber jacket, and take out the harness assembly from inside the door.

2. Installation
The installation steps are reverse to those for removal.
Note: See Removal of Right-rear Door Harness for details about the inside left-rear door harness.

Section IX Tail Door Harness

I. Harness Sketch



II. Instructions on Main Connectors

No	Connector Name	Pins	Connection	Remark
1	To in-door harness connector	6	In-door harness	
2	High mount brake light connector	2	High mount brake light	
3	Trunk switch connector	2	Trunk switch	
4	To defroster positive harness connector	2	Defroster positive harness	
5	Rear wiper motor connector	3	Rear wiper motor	
6	Ground	1	Vehicle body plate work	On the tail door plate work

III. Removal and Installation of Tail Door In-door harness

Part number: S12-3724160

(I). Preparations

Tools: sleeve wrench, cross head screwdriver, flat head screwdriver

(II). Notes

1. Do not use too much force when getting the harness through the hole in the vehicle body plate work, or the harness may get damaged and result in short circuit.
2. When disassembling the electrical components and harness, please disconnect the power supply.
3. The ignition switch must be OFF.

(III). Removal and Installation Steps

1. Removal
1.1.1. Use a cross head screwdriver to remove the left C-pillar inner shield.
(See Removal of Vehicle Body Accessories)

1.1.2. Unplug the harness plug forming abutt-joint with the in-door harness.

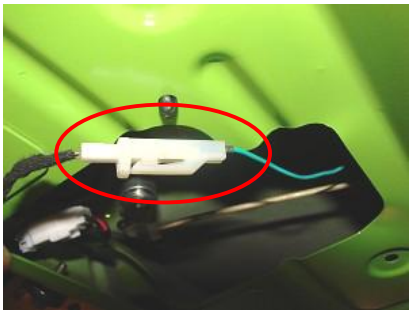
1.1.3. Disassemble the high mount brake light shield by hand.

1.1.4. Unplug the harness plug connecting the high mount brake light.

1.1.5. Use a flat head screwdriver to disassemble the tail door shield.

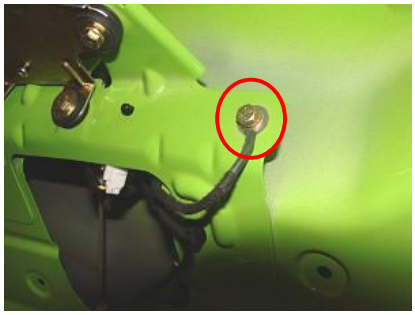
1.1.6. Unplug the rear defroster positive harness plug.

1.1.7. Unplug the trunk switch plug.



1.1.8. Unplug the rear wiper motor plug.

1.1.9. Disassemble the vehicle body ground wire. (On the tail door)



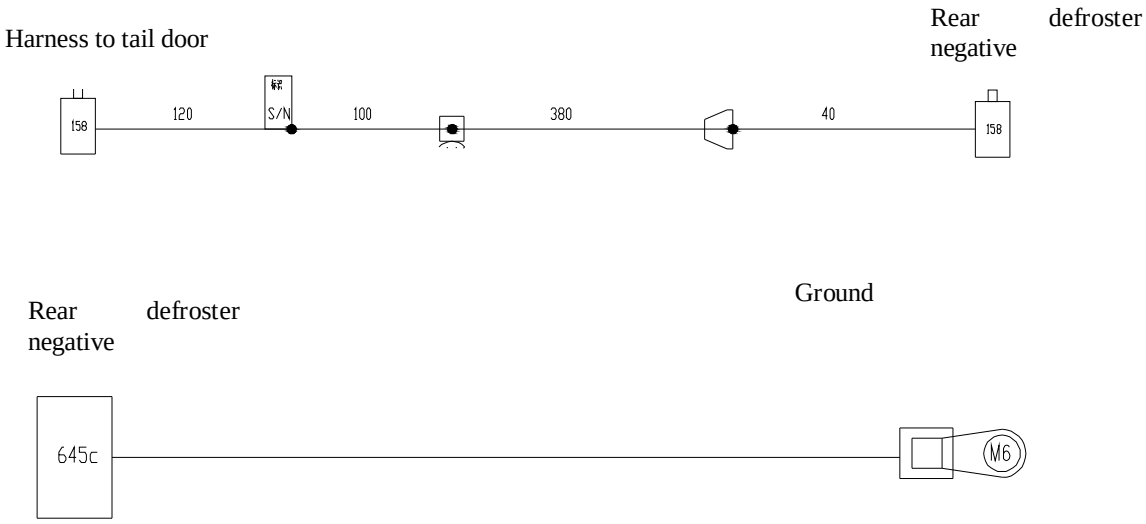
1.1.10. Removal of tail door in-door harness

2. Installation

The installation steps are reverse to those for removal, and special auxiliary tools (thin steel wire) can be used to accomplish it.

Section X Defroster Harness

I. Harness Sketch



II. Instructions on Main Connectors

No	Connector Name	Pins	Connection	Remark
1	Defroster positive connector	1	Defroster positive	
2	Defroster negative connector	1	Defroster negative	
3	Tail door harness connector	1	Tail door harness	
4	Vehicle body ground wire	1	Vehicle body	On the tail door

III. Removal and Installation of Rear Defroster Harness

Defroster harness positive part number: S12-3724530
Defroster harness negative part number: S12-3724540

(I). Preparations

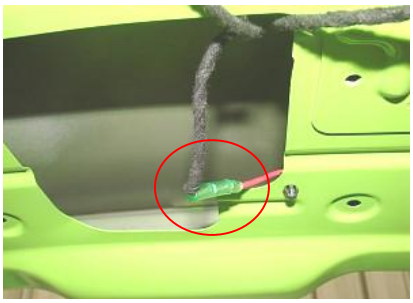
Tools: sleeve wrench, cross head screwdriver, flat head screwdriver

(II). Notes

When disassembling the electrical components and harness, disconnect the power supply.
The ignition switch must be OFF.

(III). Removal Steps

1. Unplug the defroster harness connector.



2. Unplug the left-rear defroster connector.

3 Unplug the right-rear defroster connector.

(IV) Installation Steps

The installation steps are reverse to those for removal.

Maintenance Manual for Chery A113

(Circuit Diagram)

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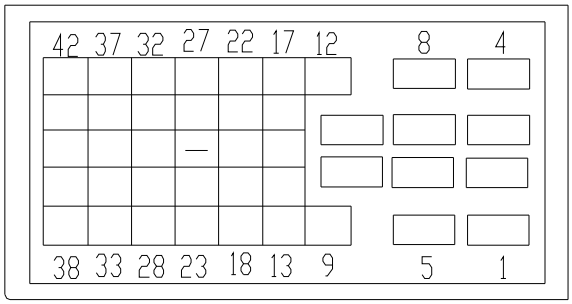
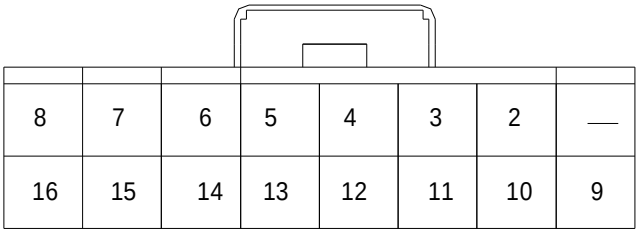
Chapter 1 Illustration Instruction

I. Definition of Main Harness Inserters

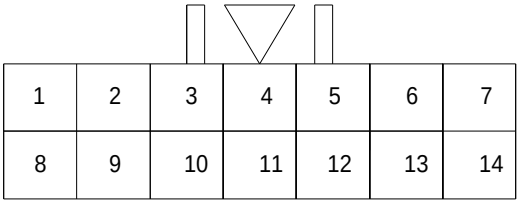
Engine/ECU (inserter of engine harness and ECU harness)



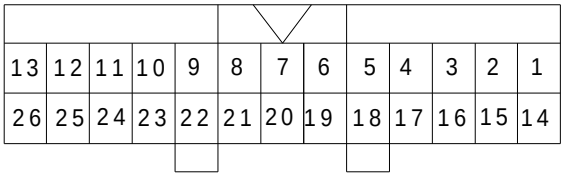
ECU/front (plug of ECU and front compartment harness)



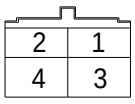
ECU/instrument (plug of ECU and instrument harness)



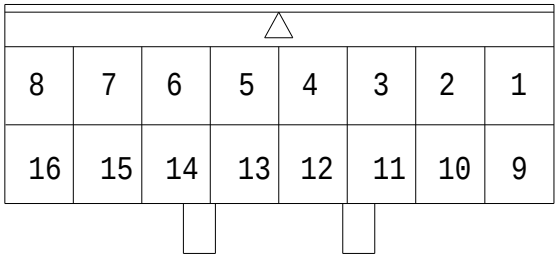
Interior/instrument A (plug A of interior harness and instrument harness)



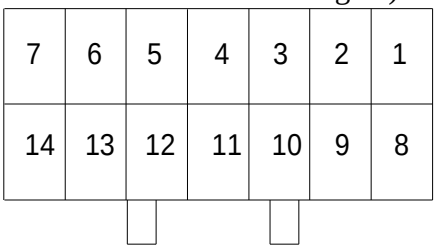
Interior/instrumentB（plug B of inte
harness and instrument harness）



Interior/front (plug of interior harness and front compartment harness)

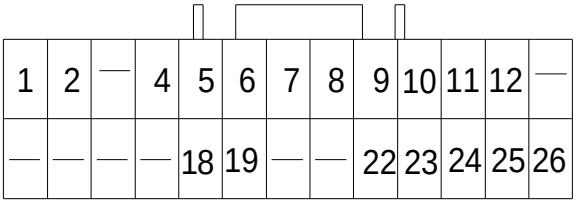


Instrument/engine A (plug A of instrument harness and engine)

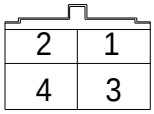


Instrument/engine B (plug B of instrument harness and engine)

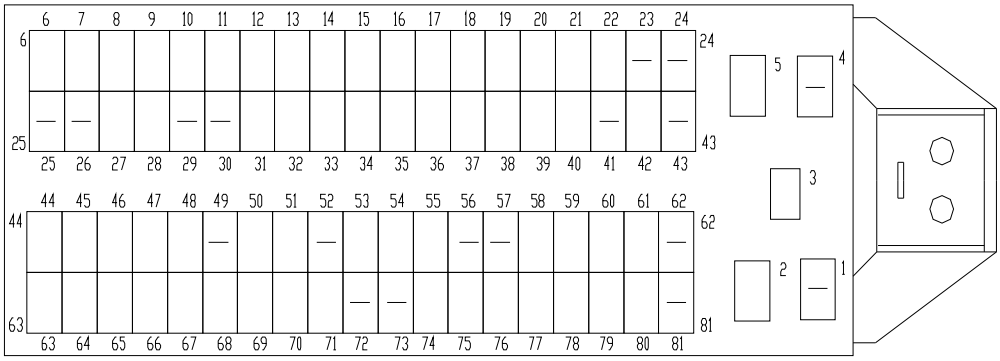
Instrument/front A (plug A of instrument harness and front compartment harness)



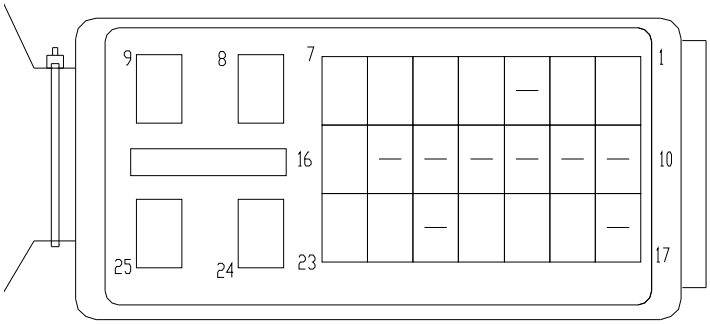
Instrument/front B (plug B of instrument harness and front compartment harness)



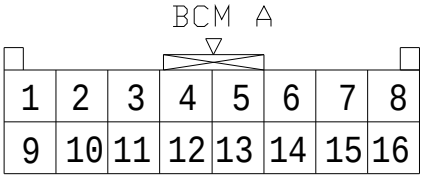
ECU pin definition



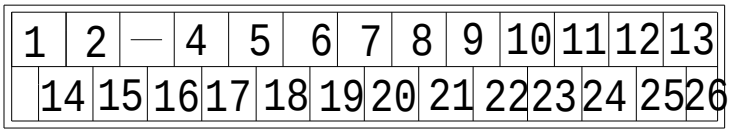
ABS pin definition



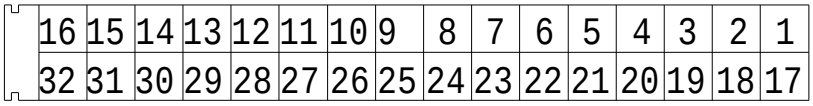
BCM A



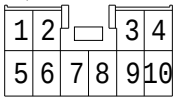
BCM B



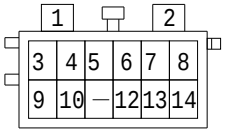
COMBINED INSTRUMENTS



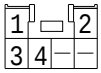
Interior/left front A (plug A of interior harness and left front door harness)



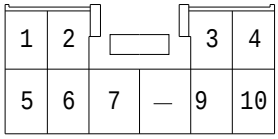
Interior/left front B (plug B of interior harness and left front door harness)



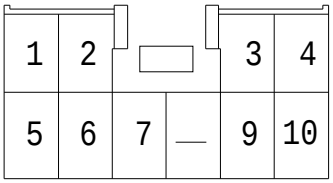
Interior/right front A（plug A of i harness and right front door harne



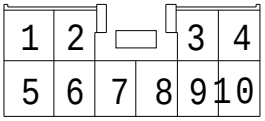
Interior/left rear（plug of interior harness and left rear door harness）



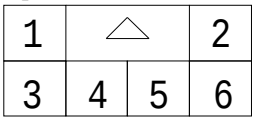
Interior/right rear（plug of interior harness and right rear door harness）



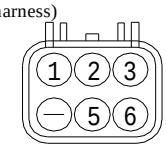
Interior/right front B（plug B of interic and right front door harness）



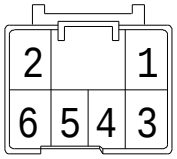
Interior/ceiling lamp (plug interior harness and ceiling lamp harness)



Interior/airbag (plug of interior harness and airb harness)



Interior/rear bumper (plug of inter harness and rear bumper harness)

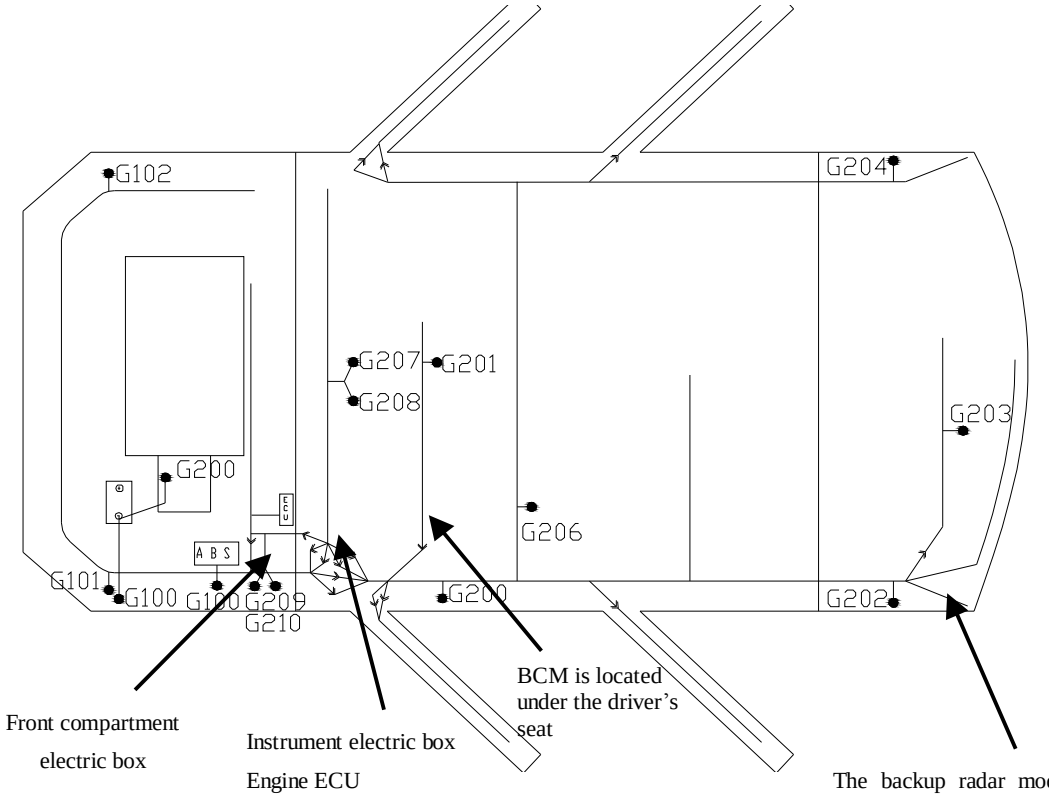


II. Definition of Body Earth Points

1. Earth Definition

G100: Body earth, ABS earth
G101: Left front compartment earth (radiator fan, low beam, high beam, position lamp, turn signal lamp, front fog lamp, wiper, brake liquid level, anti-deterrent horn)
G102: Right front compartment earth (high beam, low beam, position lamp, turn signal lamp, side turn signal lamp, front fog lamp, horn)
G200: Power train, fuel position sensor, left front door, left rear door, front ceiling lamp
G201: Electric sunroof
G202: Tail lamp, backup radar, oil pump, rear wiper motor
G203: Luggage boot door (rear wiper, high mount brake lamp)
G204: Tail lamp earth
G206: BCM, seat belt switch
G207: Cigarette lighter, fan, instrument electric box
G208: Audio equipment, combined instrument, various control switches, diagnosis socket
G209: Engine ECU earth
G210: Engine ECU earth

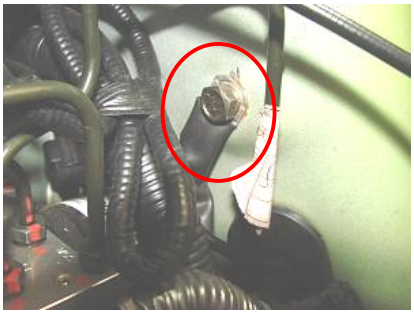
2. Distribution of Various Earth Points and Main Modules



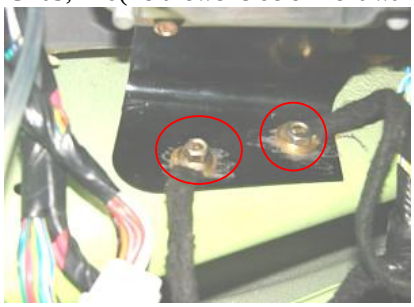
3. Photos of Earth Points

G100(Below battery)

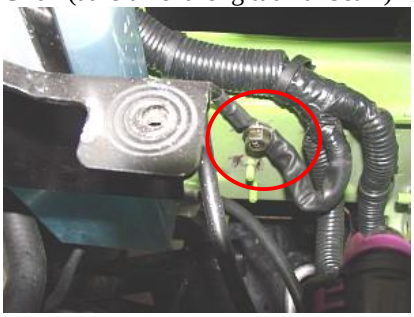
G100



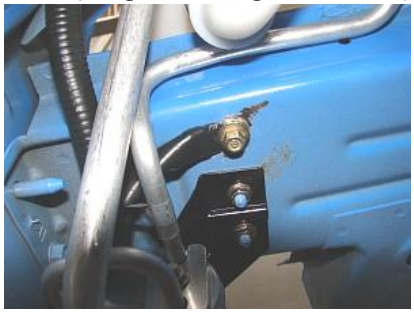
G209, 210(Left lower side of front wall)



G101 (at left front longitudinal beam)



G102 (at right front longitudinal beam)



G201(At right front ceiling armrest)

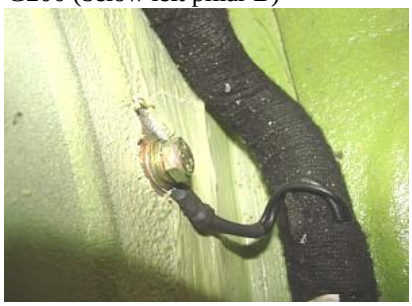
G207, 208(at secondary instrument panel)

G202 (left rear side of luggage boot)

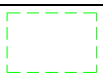
G204 (below right pillar C)

G206 (near BCM)

G200 (below left pillar B)



III. Instruction of Main Circuit Symbols

Symbol	Meaning	Symbol	Meaning
	Wiring joint		Motor
	Fuse position and specification		Bulb
	Relay		Switch control
	Shield wire		Resistance unit
	Shield wire		Electromagnetic coil
	This part is not covered within this system		LBD
	Connector		Earth

Note: Please validate specifically the real articles with the circuits for other symbols.

IV. Auxiliary Instruction of Circuit Diagram

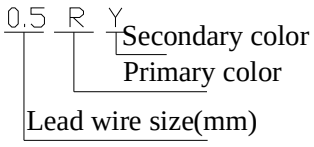
1. Instruction of Power Supply and Earth Wire

30: Primary live wire from the battery
30a: Primary live wire from the battery
15: From the ignition switch (IGN1)
15a: From the ignition switch (IGN2)
Ka: From ignition switch (ACC, disconnect at start)
58b(RHEO): power supply for noctilucence illumination
30–(GROUND): Earth wire, from cathode terminal of the battery

2. Wire Size and Color

R Red; O Orange; W White; B Black; Y Yellow; V Purple;

G Green; L Blue; Br Brown; Gr Grey; P Pink; Lg Light green;

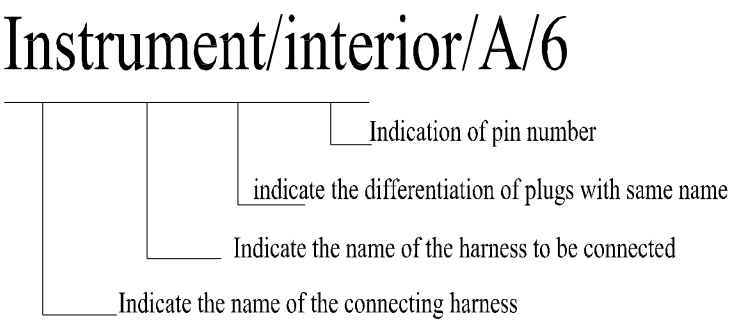


3. Definition of Main Controls

This circuit control theory diagram uses “instrument plug/” to indicate the integrated relay plug of the instrument electric box.
This circuit control theory diagram uses “ECU” to indicate the engine control unit.
This circuit control theory diagram uses “BCM” to indicate the body control module.

4. Pin Definition Explanation

The pin definition explanation of the circuit theory diagram:
For instance as follows:
4.1.


Instrument/interior/A/6
Indication of pin number
indicate the differentiation of plugs with same name
Indicate the name of the harness to be connected
Indicate the name of the connecting harness

“Instrument/interior/A/6” indicates the #6 pin of plug A of instrument harness and interior harness connectors;

4.2. “To anti-deterrent module A5” indicates “to #5 pin of plug A of anti-deterrent module”;

4.3. “To ECU25” indicates “to #25 pin of ECU";

V. Fuse Definition

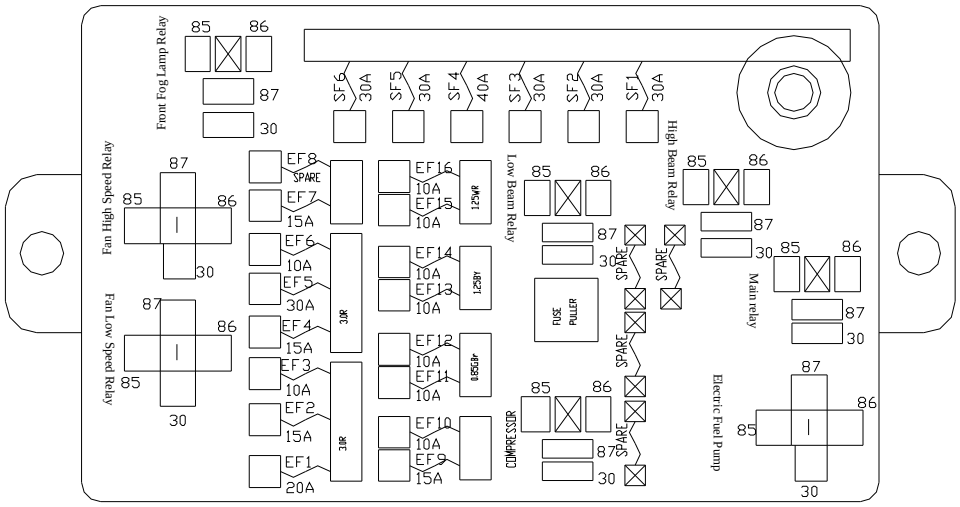
1. Fuse Number

The fuse number within the front compartment relay box is expressed by “EF+number” and “SF+number”.

The fuse number within the instrument relay box is expressed by “F+number”.

2. Fuse Position and Function Instruction

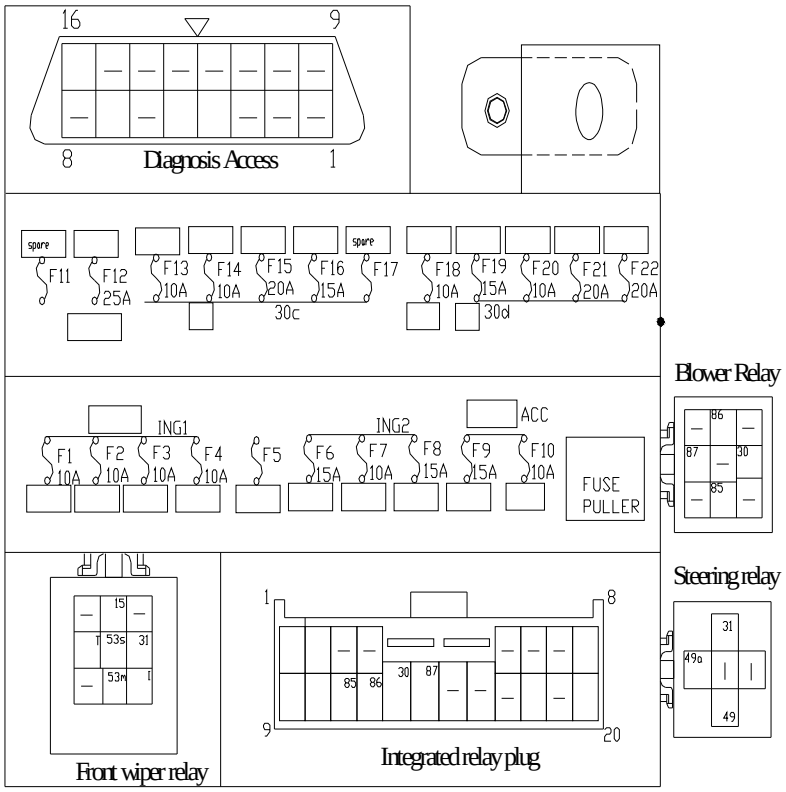
2.1. Front Compartment Relay Box Fuse



The front compartment relay box is located near the front compartment battery, with the detailed function instructions of the fuses are as follows:

Fuse No.	Capacity	Function	Fuse No.	Capacity	Function
SF1	30A	Fan, high speed	EF6	10A	Compressor
SF2	30A	BCM	EF7	15A	Oxygen sensor
SF3	30A	A/C	EF8	Vacant	Vacant
SF4	40A	Instrument electric box	EF9	15A	Ignition coil
SF5	30A	ABS	EF10	10A	Backup lamp
SF6	30A	ABS	EF11	10A	Right position lamp
EF1	20A	Fan, low speed	EF12	10A	Left position lamp
EF2	15A	Front fog lamp	EF13	10A	Right high beam
EF3	10A	ECU	EF14	10A	Left high beam
EF4	15A	Fuel pump	EF15	10A	Right low beam
EF5	30A	Primary relay	EF16	10A	Left low beam

2.2. Instrument Relay Box Fuse

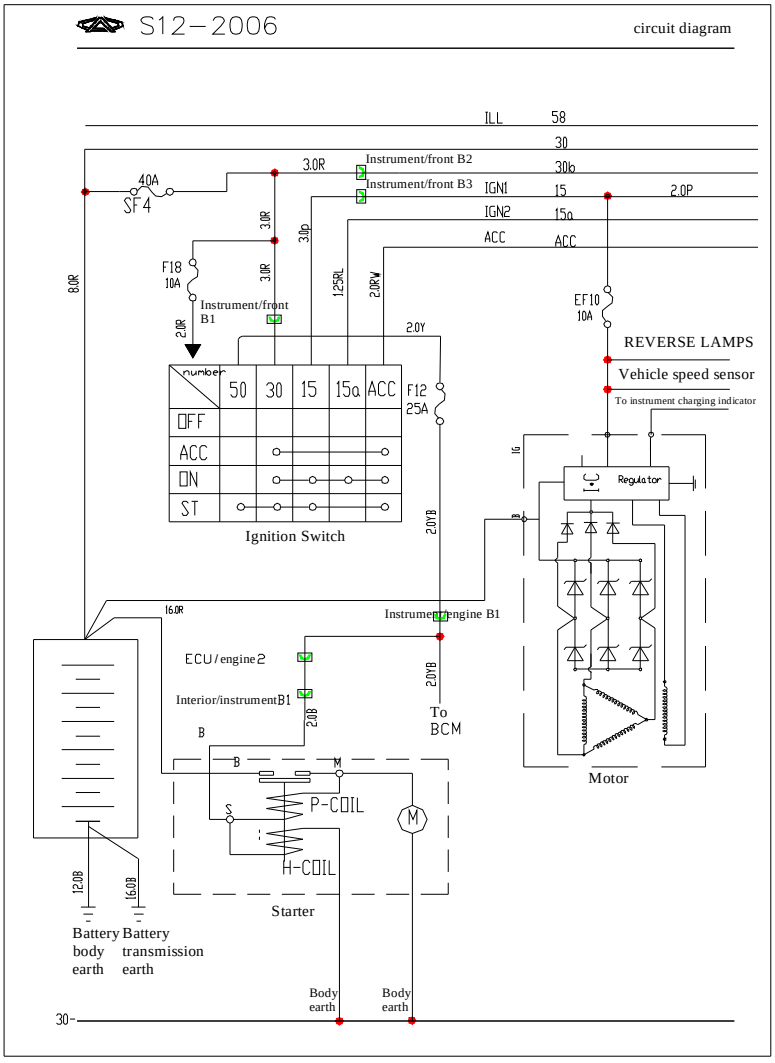


The instrument relay box is located within the left cover plate of the dashboard, with the detailed function instructions of the fuses are as follows:

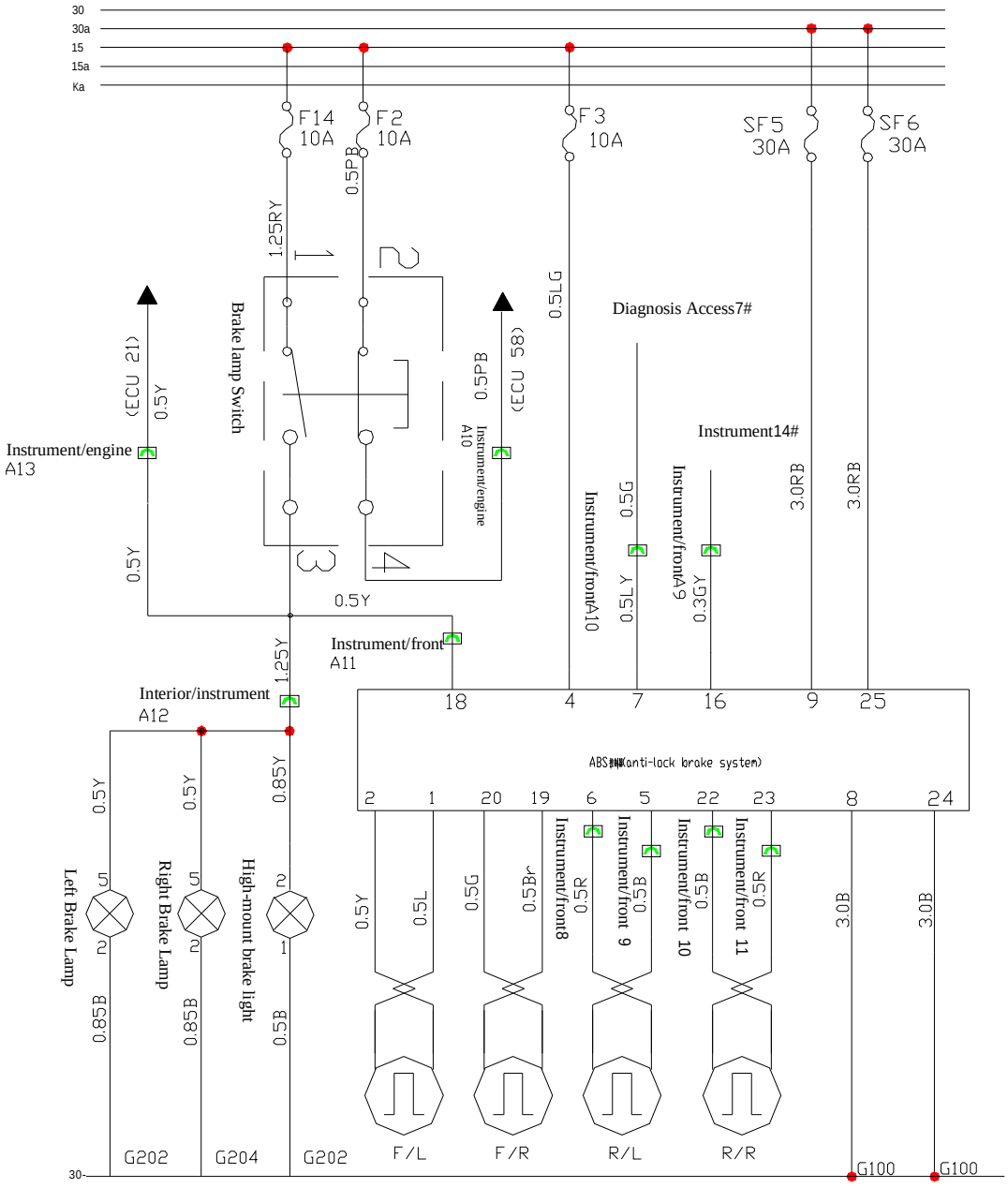
No	Specification	Functions	No	Specification	Functions
F22	20A	Rear defroster	F11		Vacant
F21	20A	Sunroof power supply	F10	10A	Radio/player control
F20	10A	Lamp switch, instrument	F9	15A	Cigar Lighter
F19	15A	Alarm switch	F8	15A	Front wiper
F18	10A	Clearance lamp, ceiling lamp	F7	10A	Steering power supply, A/C relay coil
F17		Vacant	F6	15A	Washer, rear wiper power supply, sunroof control
F16	15A	Horn, fog lamp	F5		Vacant
F15	20A	Audio device	F4	10A	Air Bag
F14	10A	Braking Lamp	F3	10A	ABS control
F13	10A	Diagnosis Access	F2	10A	Rear view mirror, brake switch, BCM
F12	25A	Start	F1	10A	COMBINED INSTRUMENTS

Chapter 2　Circuit Control Theory Diagram

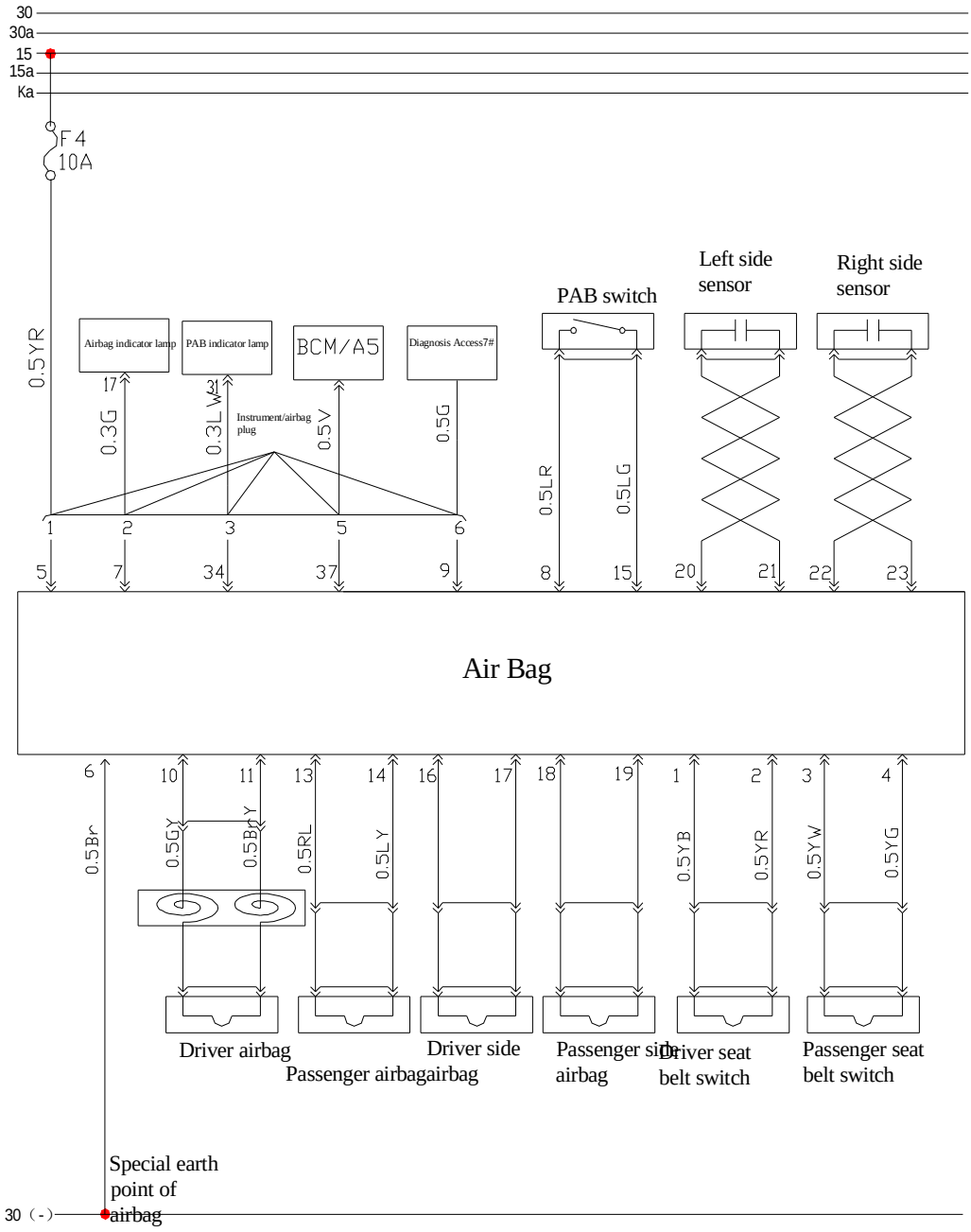
I. Starter Charging System



II. ABS Control System



III. Airbag

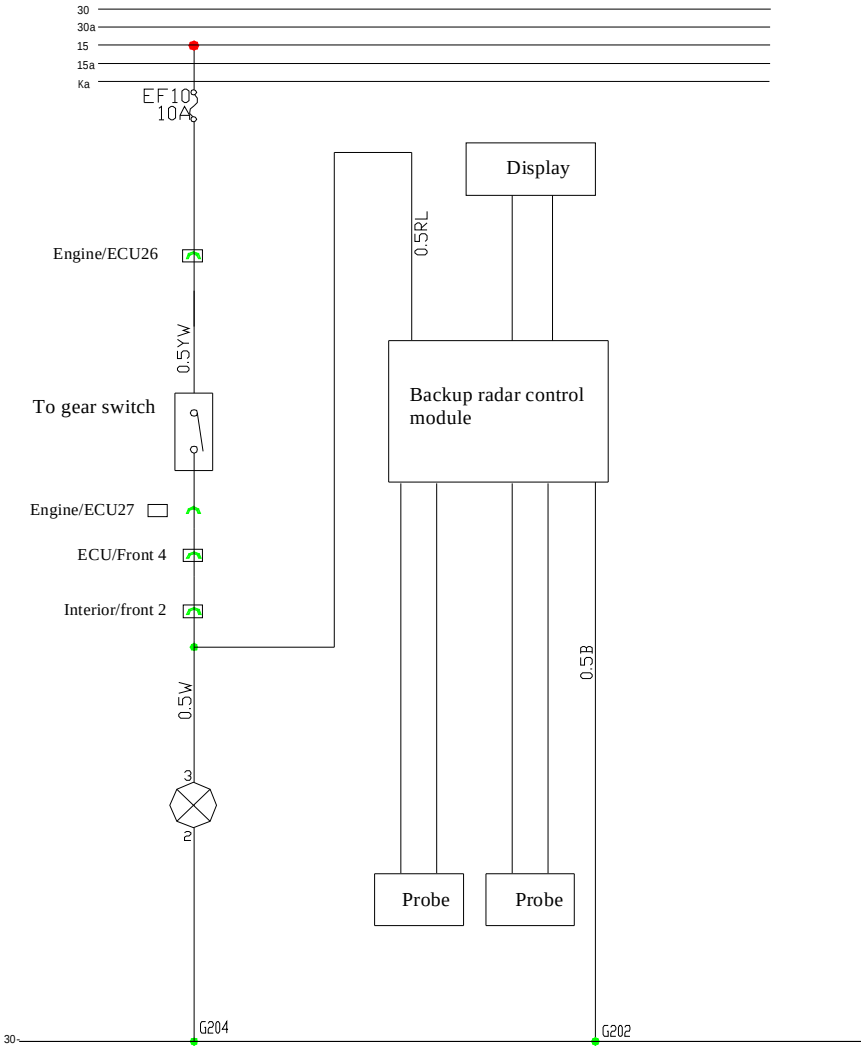

30
30a
15
15a
Ka
F4
10A
0.5YR
Airbag indicator lamp
PAB indicator lamp
BCM/A5
Diagnosis Access7#
17
31
0.3G
0.3L W
Instrument/airbag plug
0.5V
0.5G
PAB switch
Left side sensor
Right side sensor
0.5LR
0.5LG
1
2
3
5
6
5
7
34
37
9
8
15
20
21
22
23
Air Bag
6
10
11
13
14
16
17
18
19
1
2
3
4
0.5Br
0.5G Y
0.5Br Y
0.5RL
0.5L Y
0.5YB
0.5YR
0.5YW
0.5YG
Driver airbag
Passenger airbag
Driver side airbag
Passenger side airbag
Driver seat belt switch
Passenger seat belt switch
Special earth point of airbag
30 (-)

IV. Backup Radar

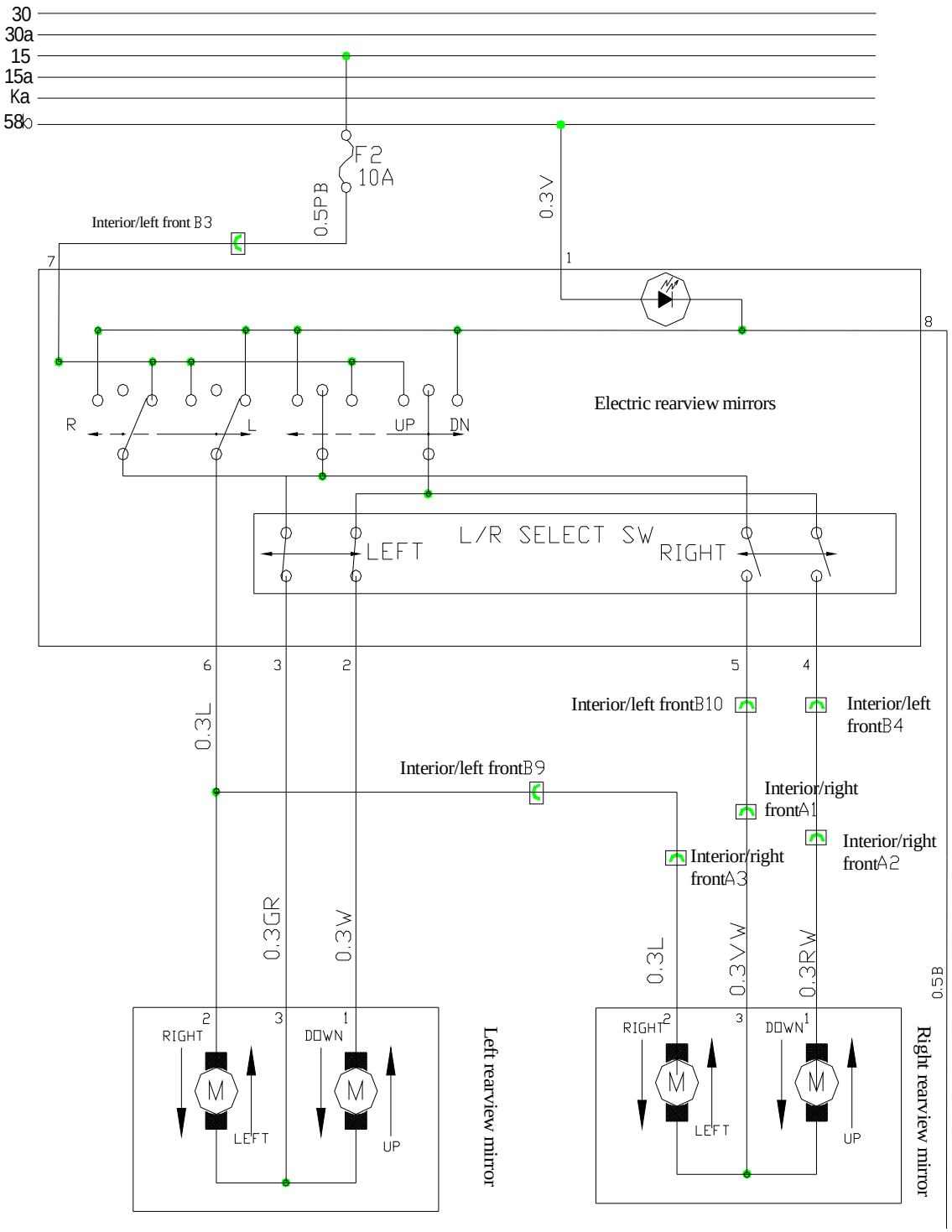
S12－2006

circuit diagram

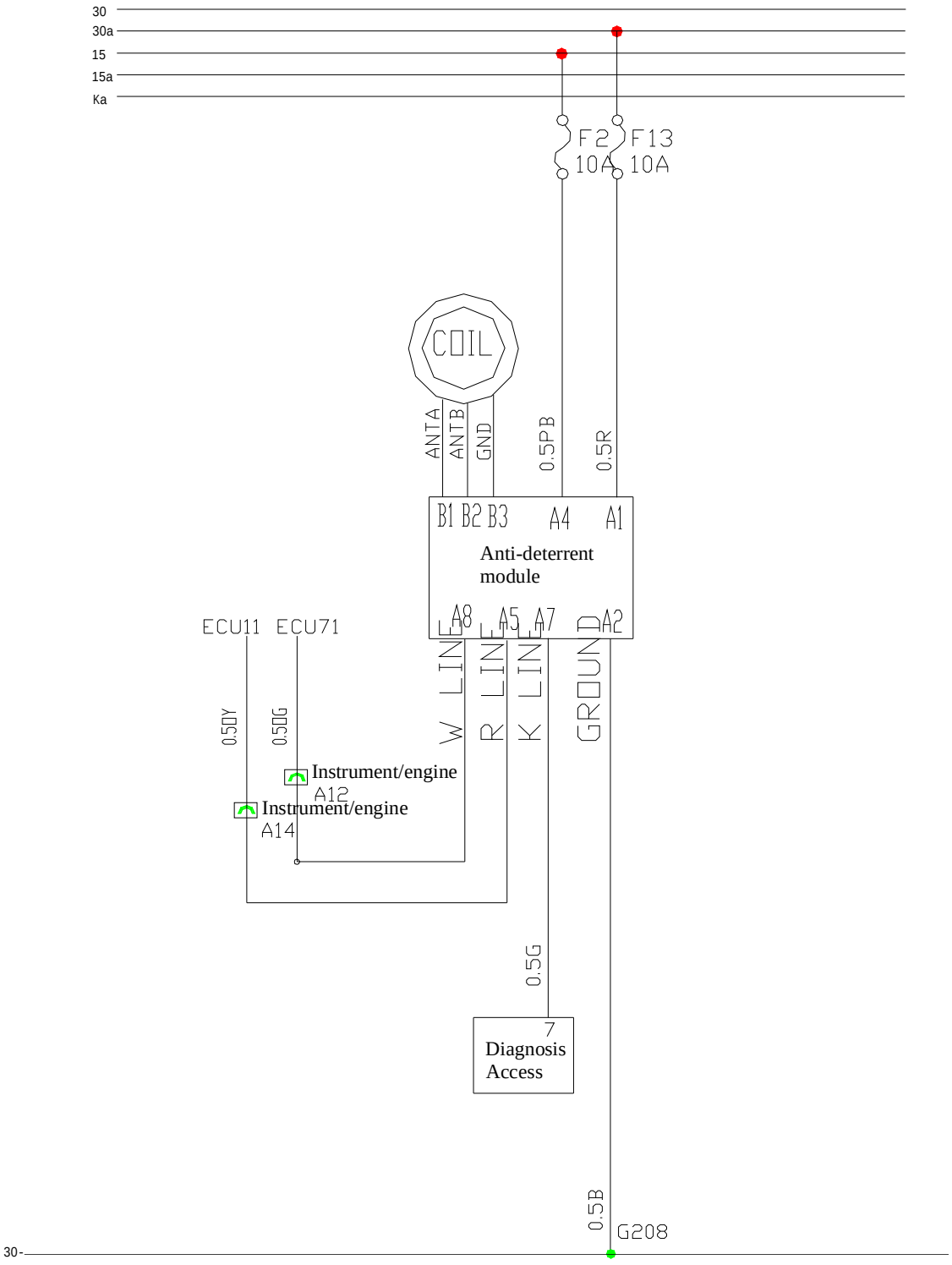
backup radar



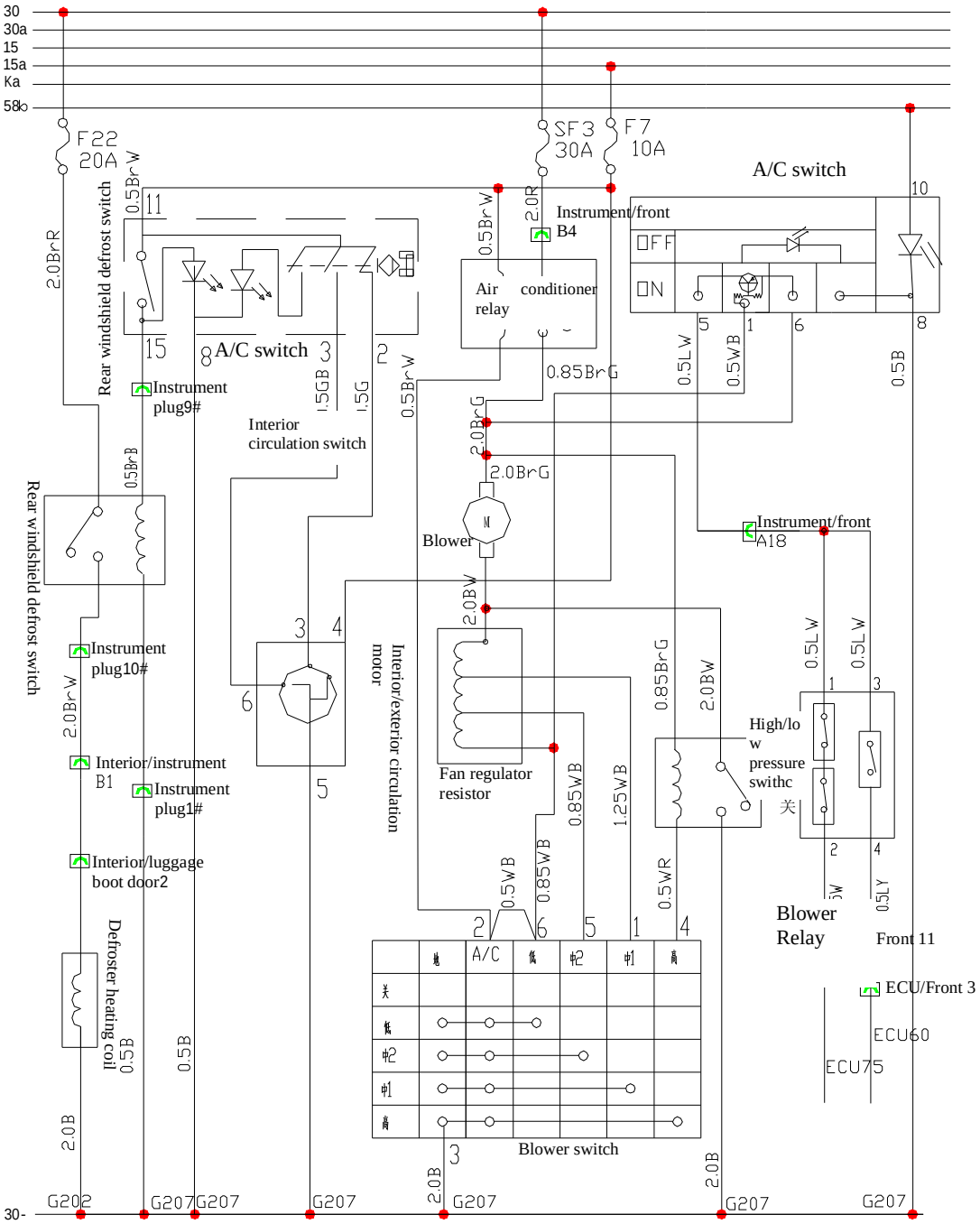
V. Electric Rear View Mirror



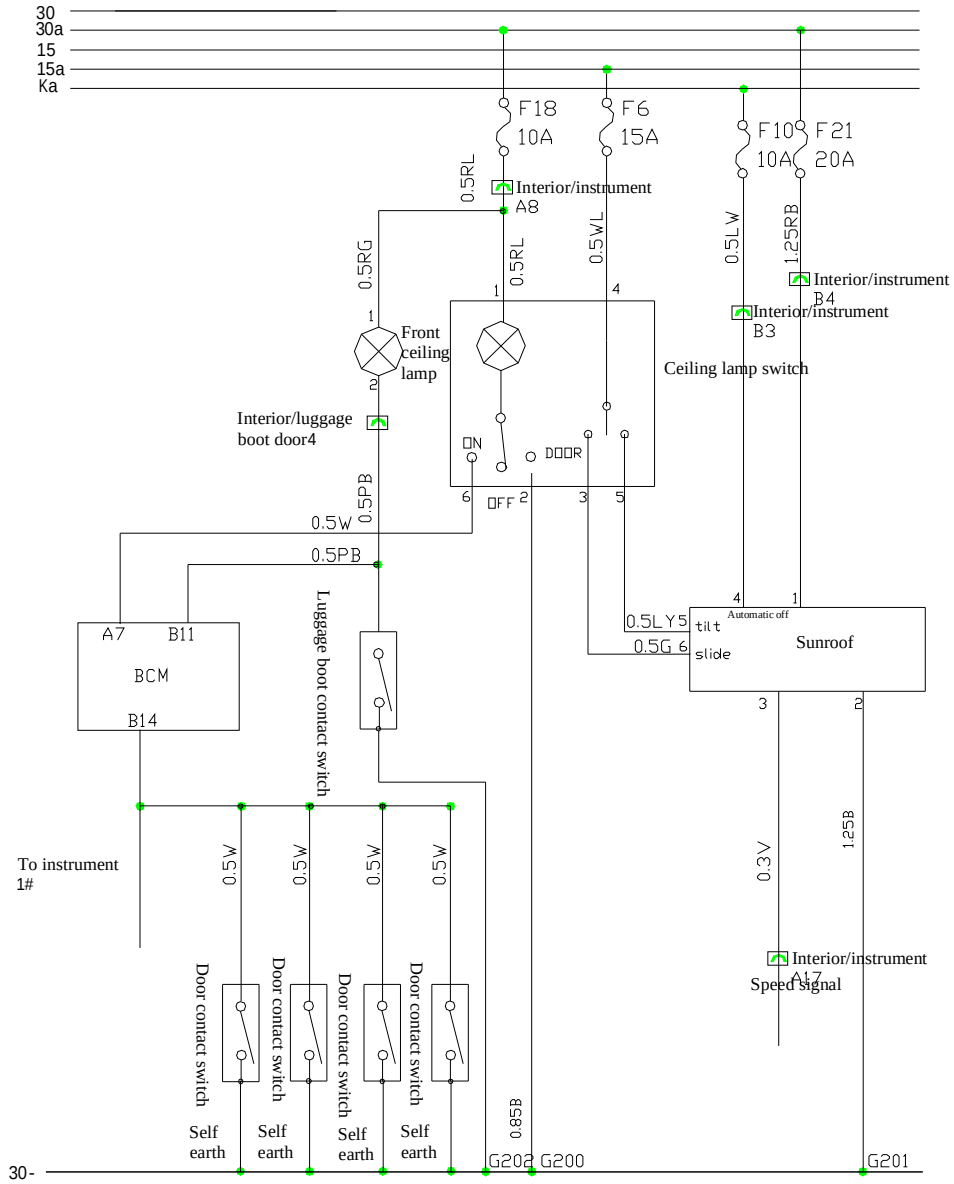
VI. Engine Anti-Deterrent



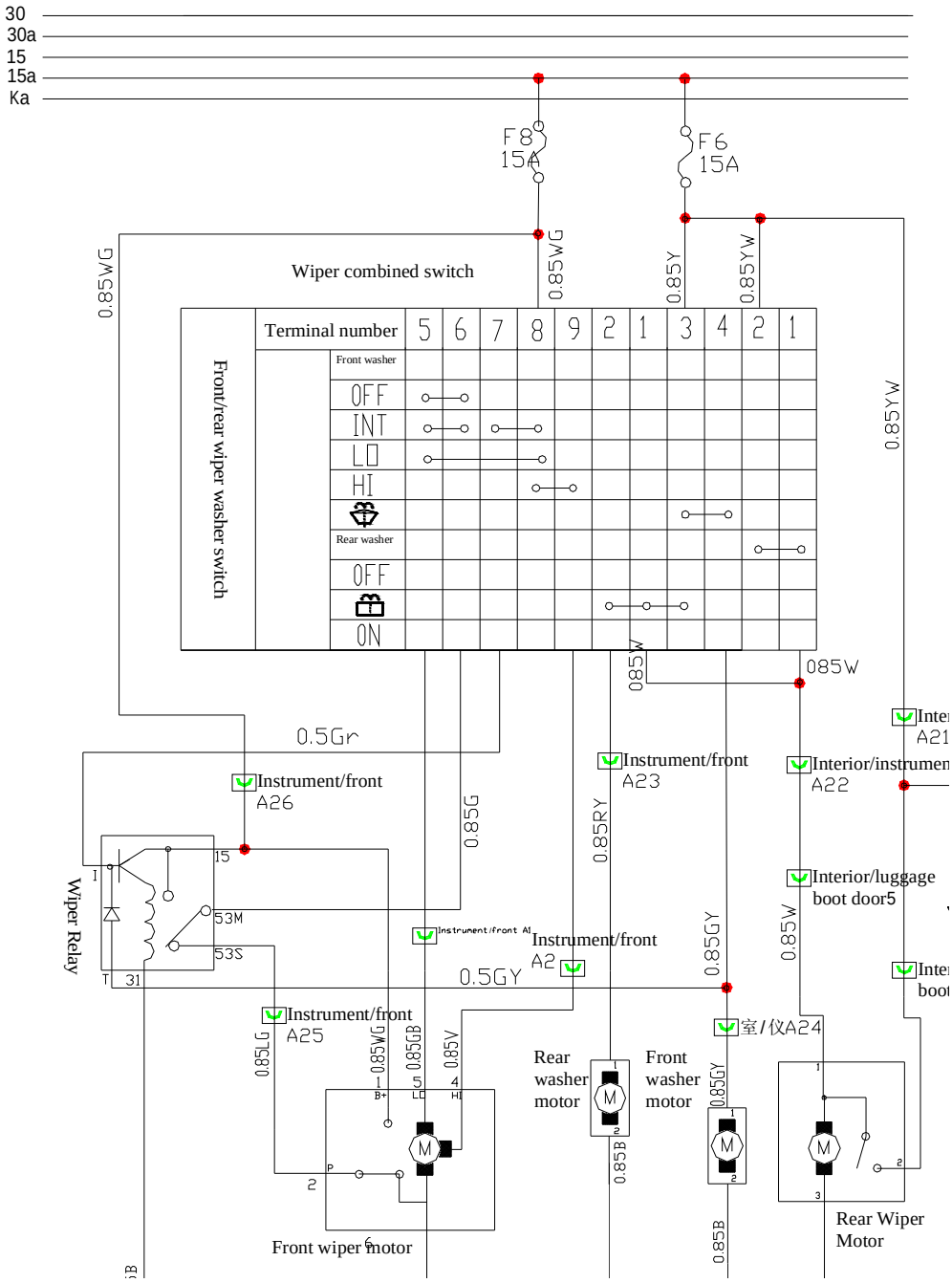
VII. A/C, Defroster System



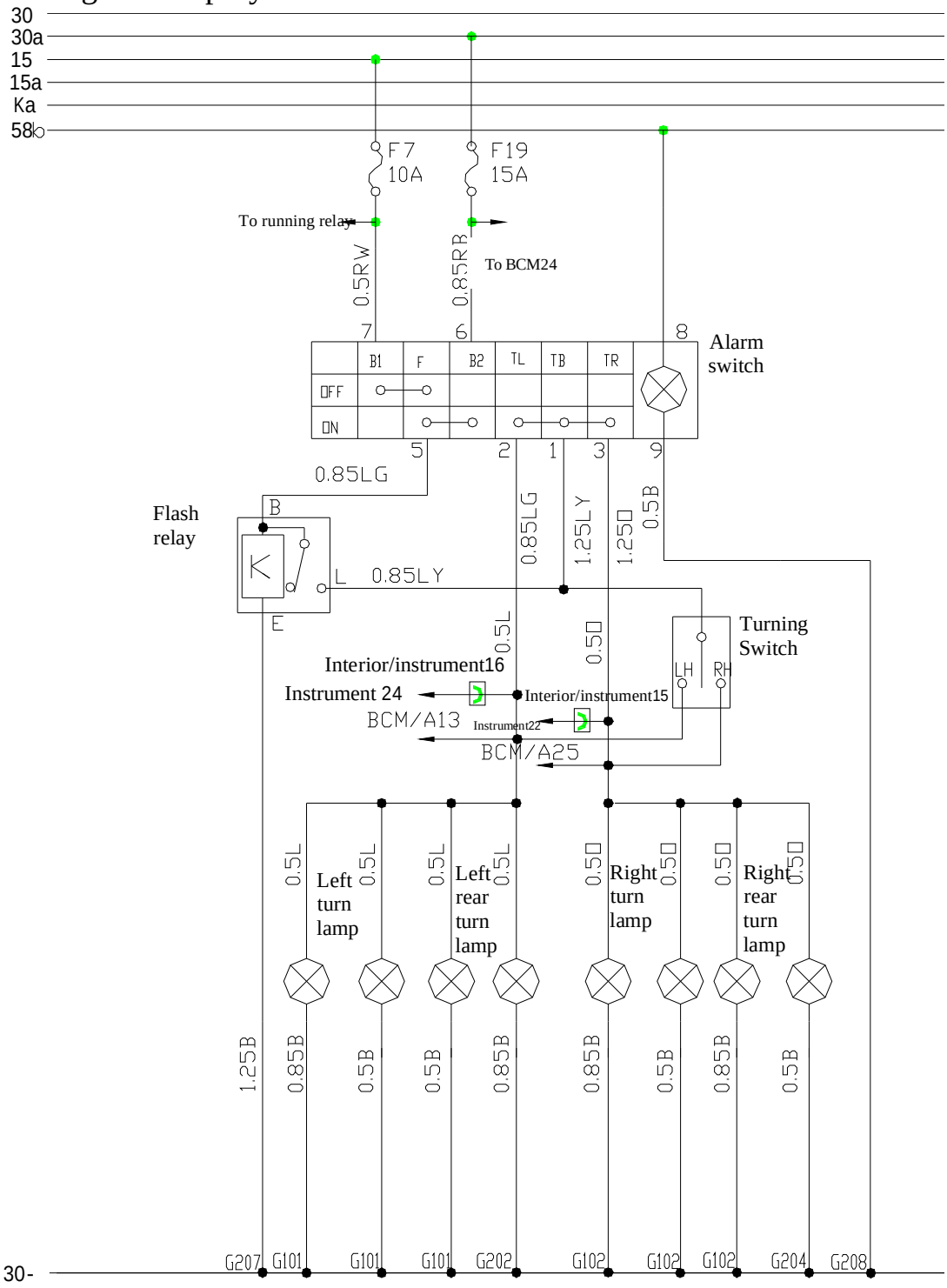
VIII. Ceiling Lamp, Luggage Boot Lamp, and Sunroof System



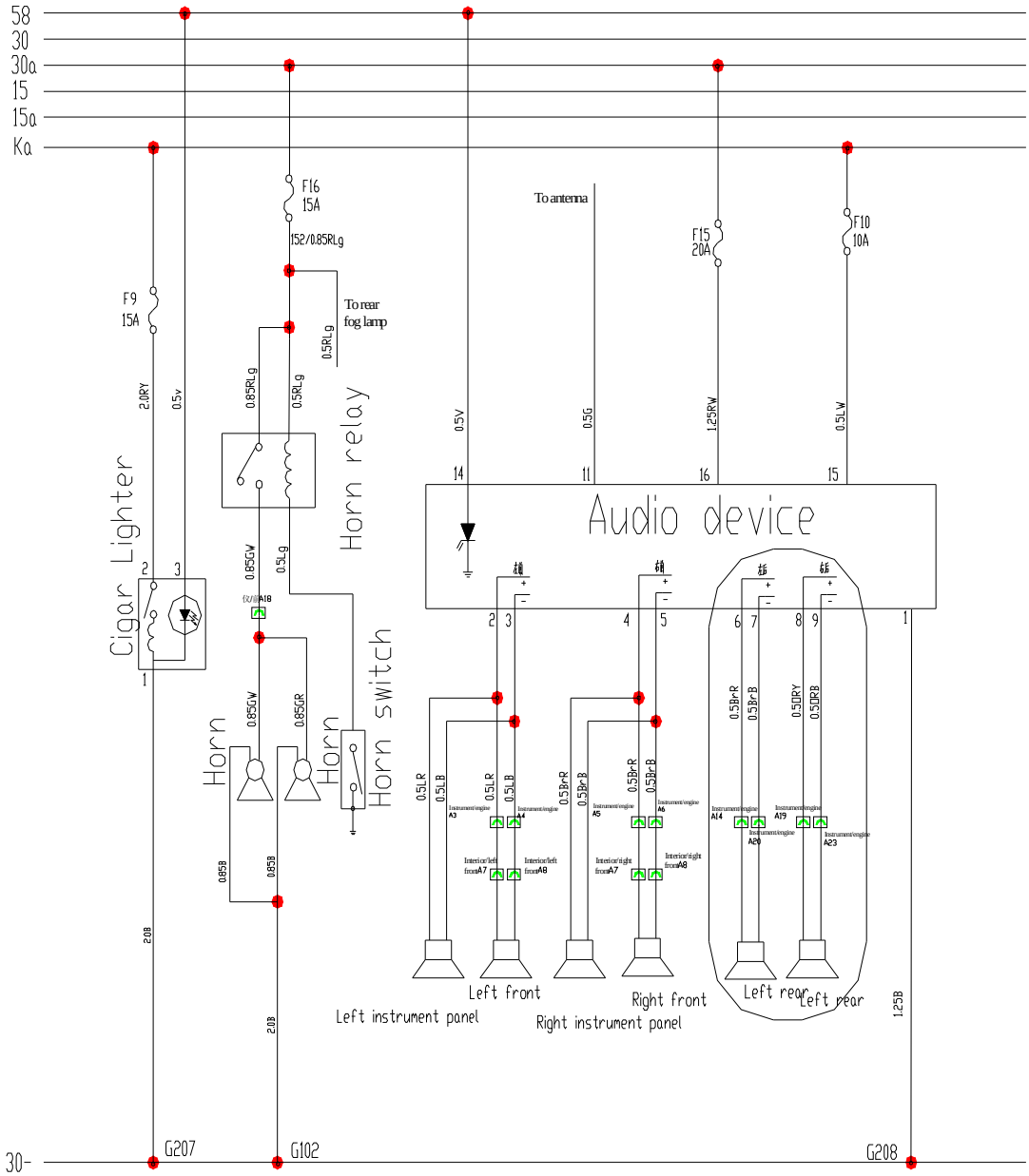
IX. Front/Rear Wiper System



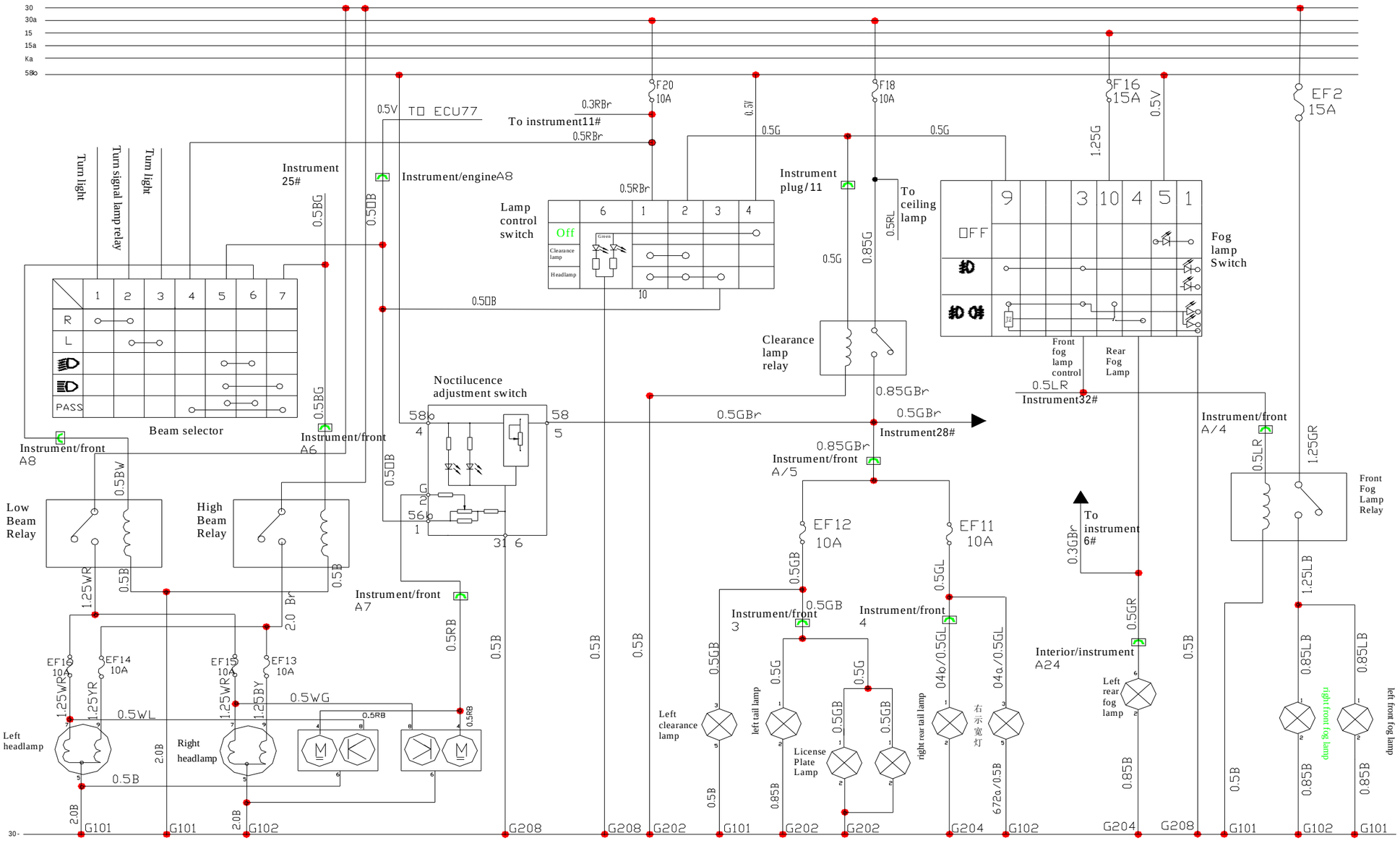
X. Turn Signal Lamp System



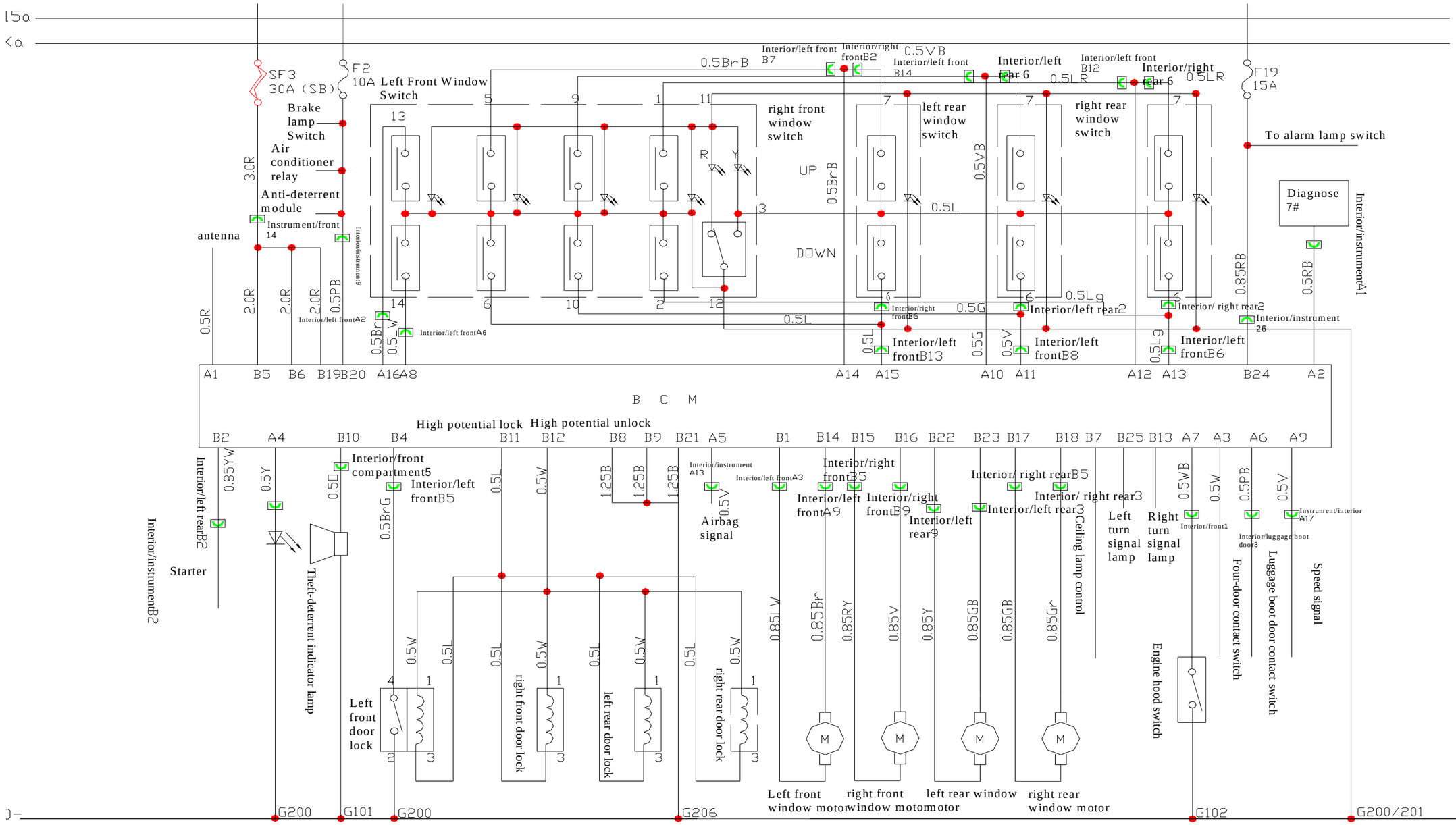
XI. Radio/Player, Horn, Cigarette Lighter



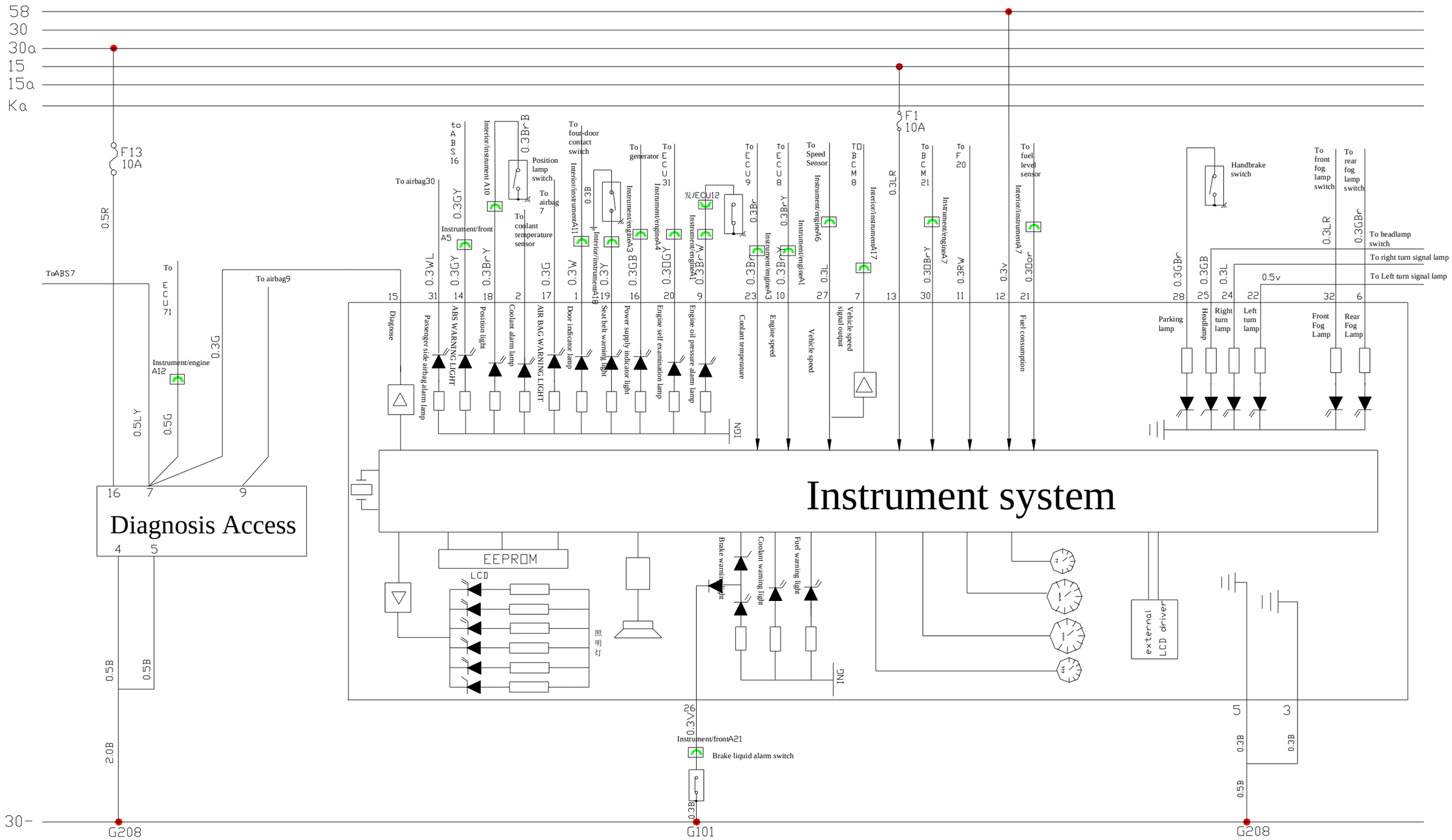
XII. Headlamp, Fog Lamp System



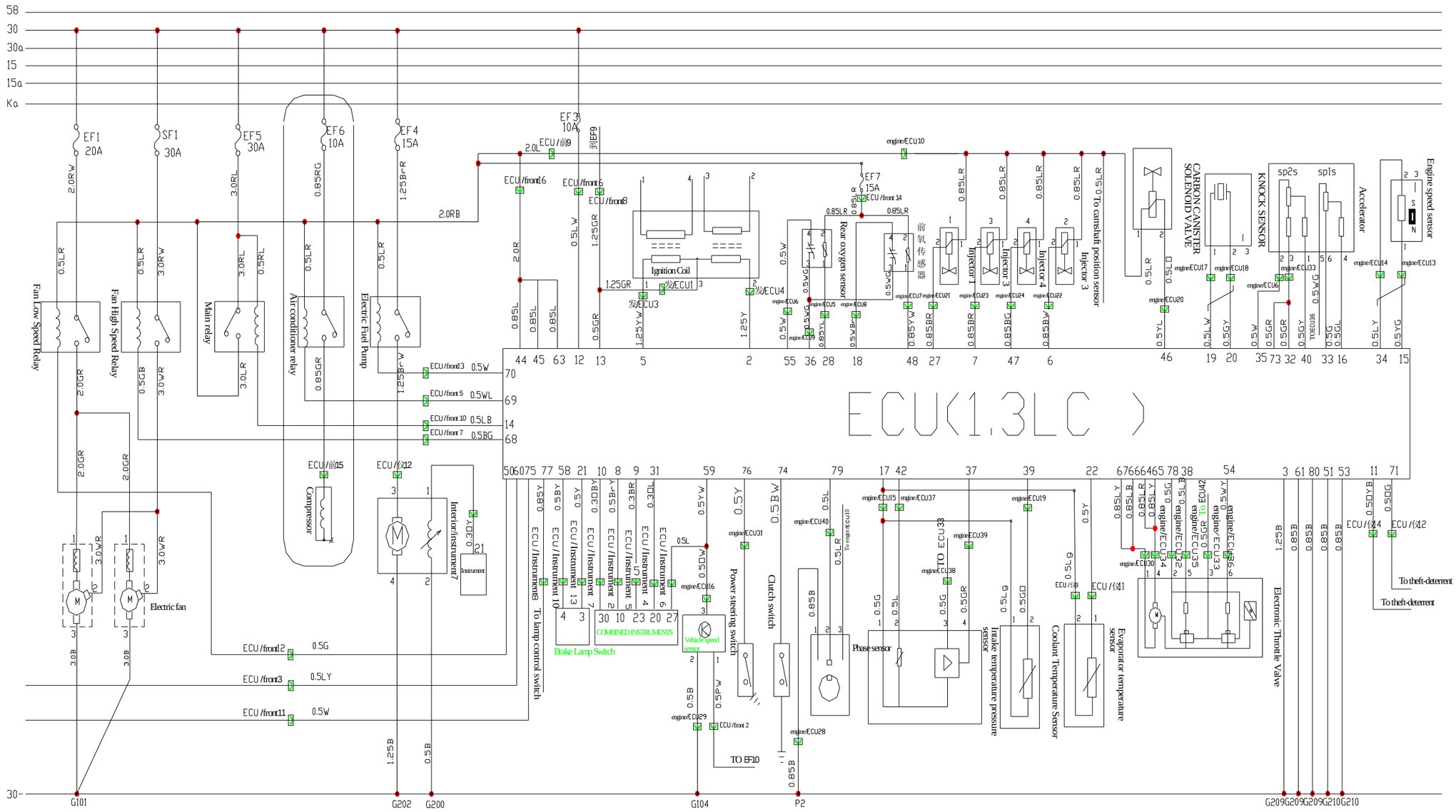
XIII. BCM System



XIV. Instrument System



XV. 473 Engine and Liandian Electric Injection System



Mando MGH-25 Anti-Lock Brake System
User's Manual

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Common Abbreviations and Acronyms in This Manual

FL——*Front Left*

FR——*Front Right*

RL——*Rear Left*

RR——*Rear Right*

ABS——*Anti-lock Brake System*

EBD——*Electronic Brake Distribution*

ECU——*Electronic Control Unit*

HU、**HCU**——*Hydraulic (Control) Unit*

HECU——*ECU+HCU*

LPA——*Low Pressure Accumulator*

MCP——*Master Cylinder Primary, one of two outlet of master cylinder. P refers to primary.*

MCS——*Master Cylinder Secondary, one of two outlet of master cylinder. S refers to secondary*

SDL——*Serial Data Link*

I. Product Instruction

1. ABS Overview

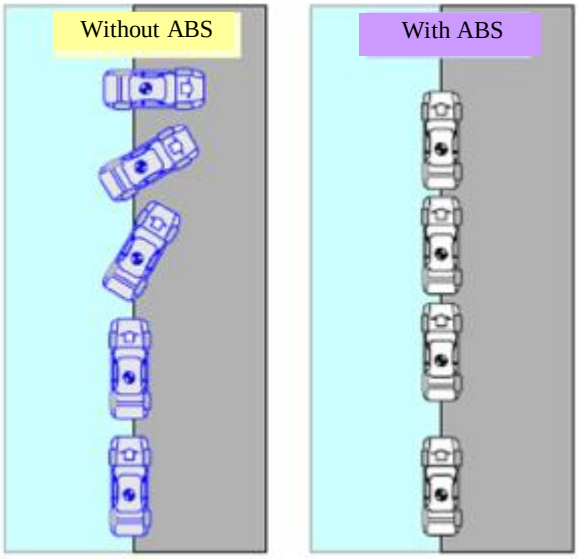
1.1 System Function

① Promotion of vehicle stability;

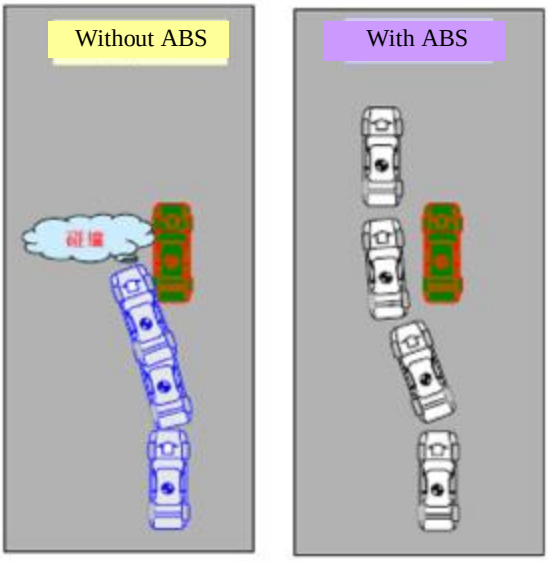
② Guarantee of vehicle steering ability;

③ Guarantee of shortest brake distance.

1.2 Comparison between with and without ABS braking effects

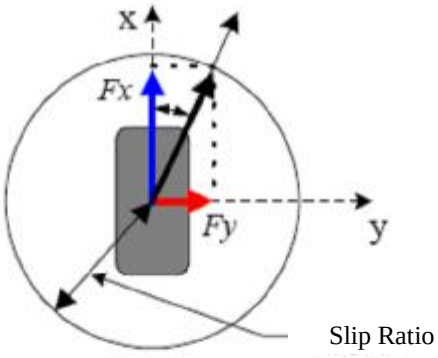


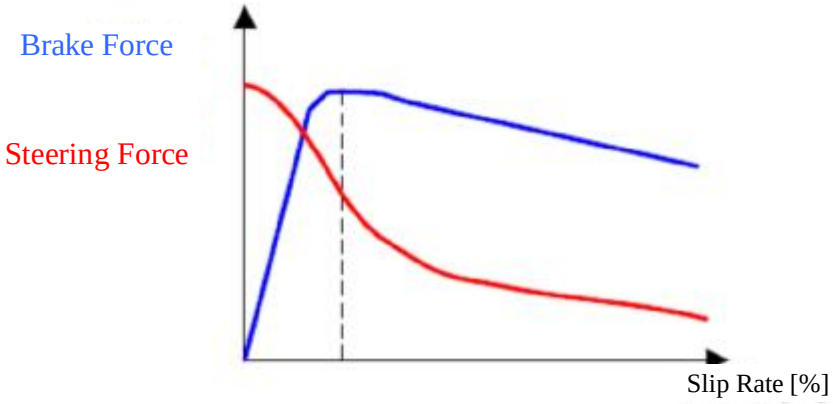
Braking on Bisectional Roads (Split)



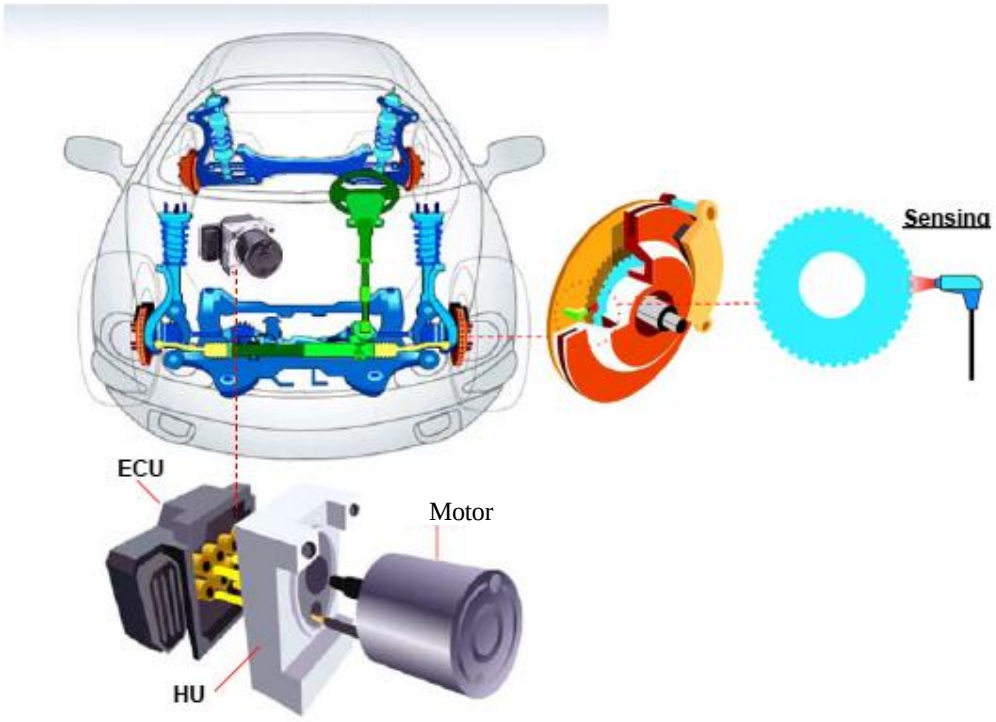
Evading the obstacles during braking

1.3 Tire Dynamic Characteristics





2. System Structure

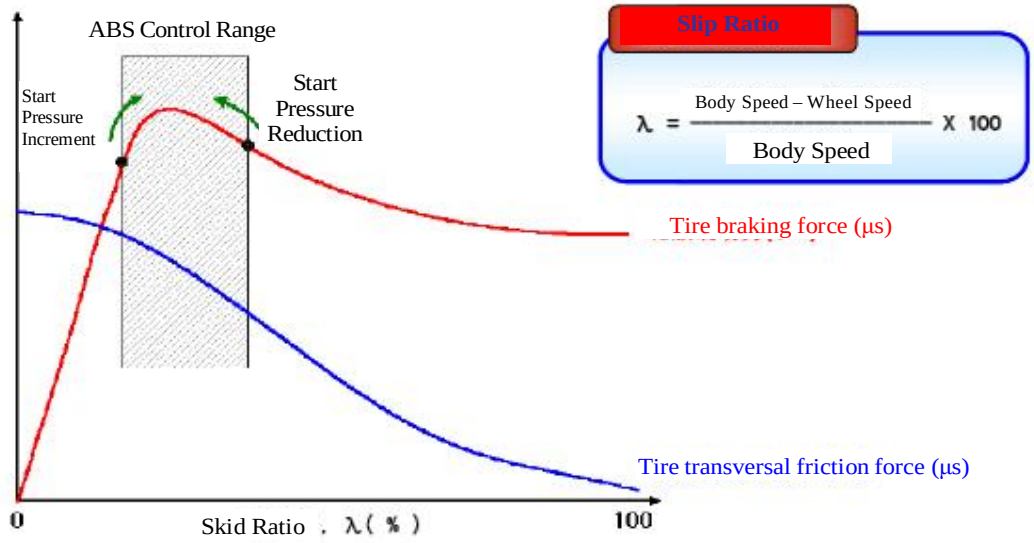


Including:

Electronic Control Unit	The sensor will calculate the speed and acceleration/deceleration of four wheels and judge the skid status of the wheels and therefore drive the electromagnetic valve and motor, control the pressure increment and pressure reduction, maintain the status, and etc.
Hydraulic Unit	The basic hydraulic circuit is comprised of the 1st circuit and the 2nd circuit that is active only when the ABS is functioning and is the integral part that controls the hydraulic parts transmitted to various wheels. Depending on the transmitted signal output of the sensor, the ECU performs the calculation and judges the skid status to determine if it's necessary to run the ABS. Therefore, depending on the control procedure of the ECU, the electromagnetic valve and the motor will be started to control the pressure increment and pressure reduction, maintain the status, and etc.
Sensor	In order to make the ECU to calculate the speed and acceleration/ deceleration of the four wheels, it always transmits the revolution measurement of the gear ring to the ECU.
Motor	When the ABS is functioning, the motor will rotate following the ECU signal and convert the rotation movement into linear reciprocated movement via the bearing to circulate the brake oil.

3. System Functioning Theory

3.1 ABS Control Theory


ABS Control Range
Start Pressure Increment
Start Pressure Reduction
Slip Ratio
λ = Body Speed – Wheel Speed / Body Speed X 100
Tire braking force (μs)
Tire transversal friction force (μs)
0
Skid Ratio , λ(%)
100

λ= 0%: The status that the brake is not functioning

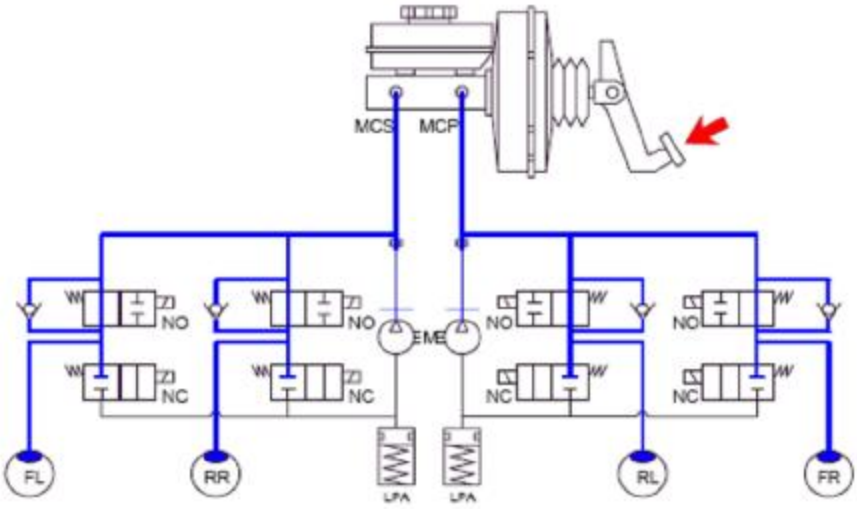
λ= 100%: The status that the wheels are locked

3.2 ABS Control Mode

① Functioning Status of General Brake

For the vehicles equipped with ABS, if the braking pressure applied onto the wheels is not enough to lock the wheels, the pressure generated by the general pump will transmit to the wheel branch pump via the normal open valve to obtain the braking effects. When it's unnecessary for further braking, the driver will reduce the pressure on the brake pedal and then the brake liquid of various wheels will return to the general pump to reduce the braking pressure.

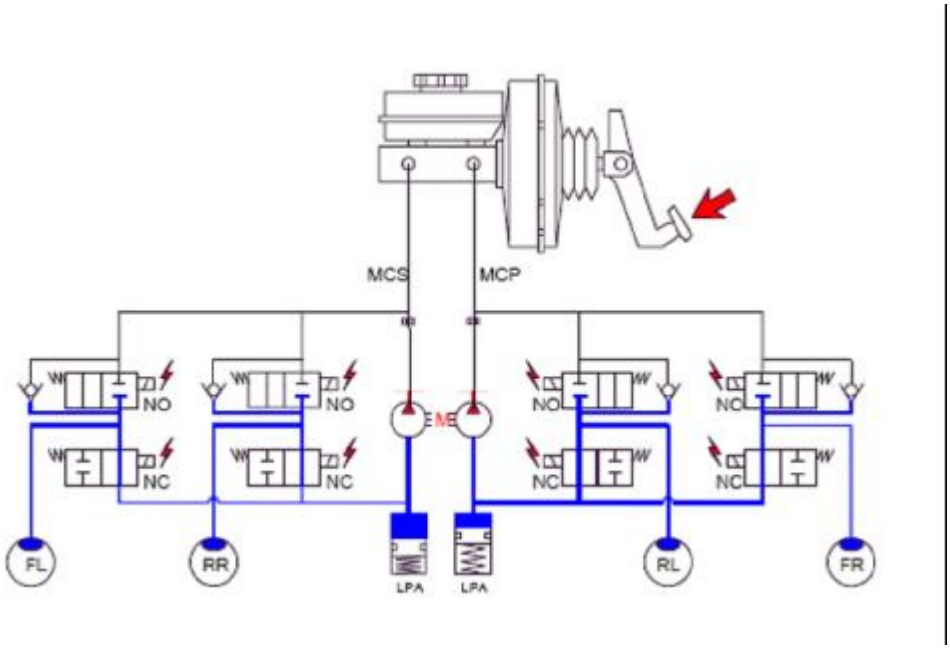
Solenoid Valve	Power Status	Solenoid Valve Status
Normal Open Valve (NO Valve)	OFF	Open
Normal Close Valve (NC Valve)	OFF	Close



② ABS Functioning (Pressure Reduction) Status

For the vehicles equipped with ABS, if the applied braking pressure is too big, the wheels will have rapider deceleration than that of vehicle body, which will be ready to result the lock of the wheels. Under such case, the ECU will transmit the code for wheel pressure reduction to the HCU, namely turn off the normal open valve and turn on the normal close valve to reduce the pressure of wheel branch pump. In such case, the brake oil released by the wheel branch pump is temporarily stored in the low pressure accumulator (LPA). The brake oil stored in the LPA will be sucked back to the general pump by the oil pump started following the rotation of the motor. The brake liquid will return to the high pressure accumulator (HPA) in the pipeline and reduce the high pressure pulse generated by the running of the oil pump by means of the orifice hydraulic resistance.

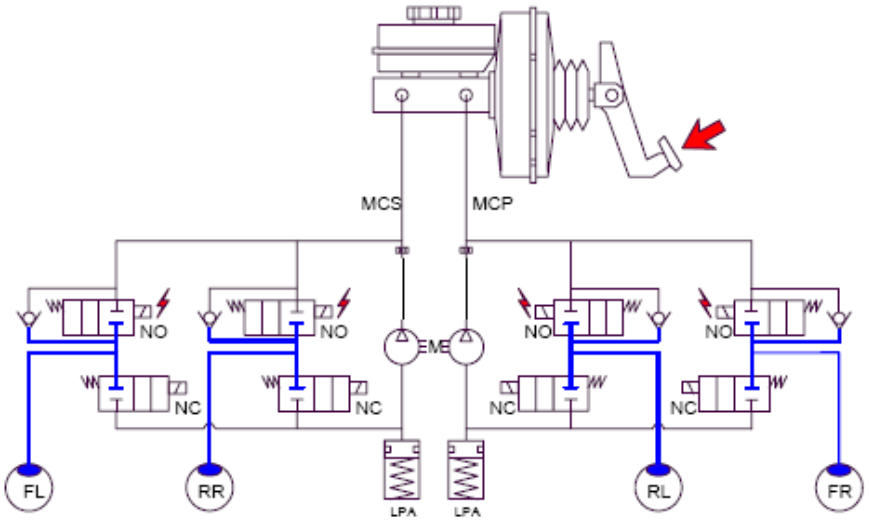
Solenoid Valve	Power Status	Solenoid Valve Status
Normal Open Valve (NO Valve)	ON	Close
Normal Close Valve (NC Valve)	ON	Open



③ ABS Functioning (Maintaining) Status

When the branch pumps of the wheels are applied with proper pressure via the pressure reduction or pressure increment, the normal open valve and the normal close valve will be turned off to maintain the pressure of the wheel branch pumps. For the operations mentioned in above ② ~ ④, depending on that wheels are locked or not, the ABS will function till the vehicle is fully stopped and therefore the safety and steering capability of the vehicle are guaranteed.

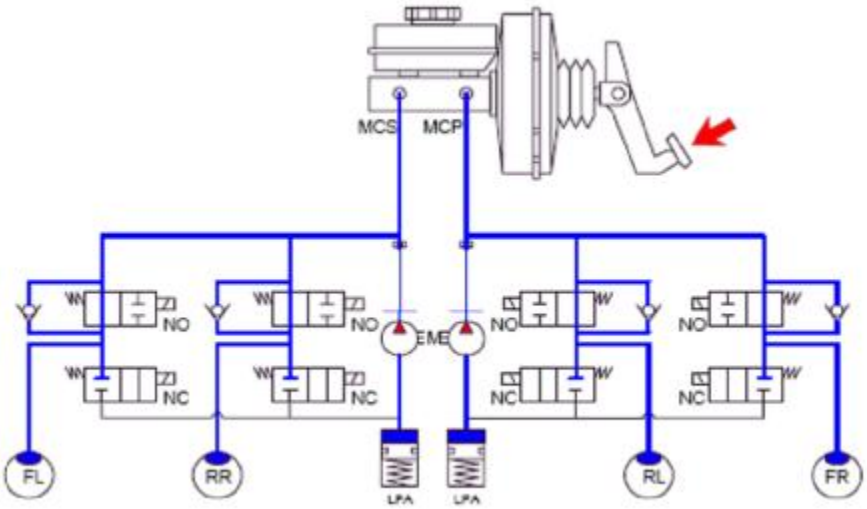
Solenoid Valve	Power Status	Solenoid Valve Status
Normal Open Valve (NO Valve)	ON	Close
Normal Close Valve (NC Valve)	OFF	Close



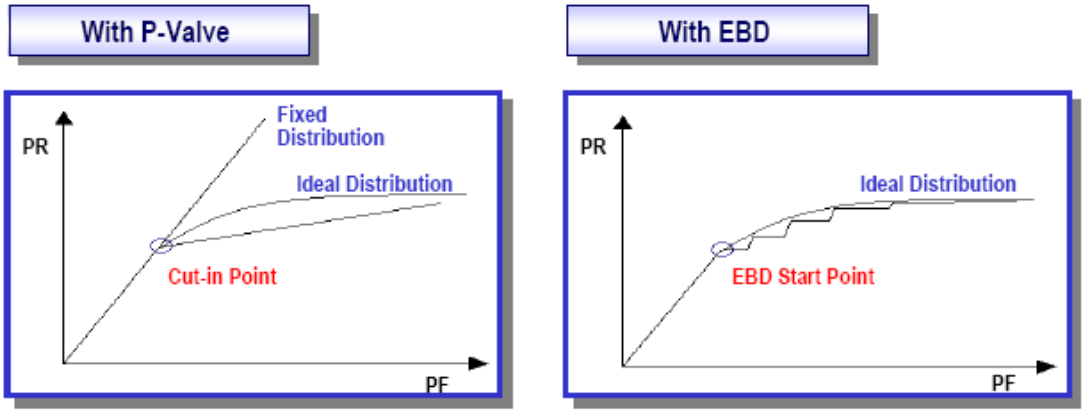
④ ABS Functioning (Pressure Increment) Status

During the implementation of the pressure reduction, if the excessive brake liquid is drained or the friction coefficient between the wheels and the road is increased, it's necessary to increase the pressure of various wheels. Under such case, the ECU will transmit the code for wheel pressure increment to the HCU, namely turn on the normal open valve and turn off the normal close valve to increase the pressure of wheel branch pump. During the implementation of the pressure reduction, the brake liquid stored in the low pressure accumulator (LPA) will continue to rotate the motor to drain the brake liquid under the pressure increment status. In such case, the brake liquid is supplied to branch pump of various wheels via the general pump and normal open valve. The brake liquid will return to the high pressure accumulator (HPA) in the pipeline and reduce the high pressure pulse generated by the running of the oil pump by means of the orifice hydraulic resistance.

Solenoid Valve	Power Status	Solenoid Valve Status
Normal Open Valve (NO Valve)	OFF	Open
Normal Close Valve (NC Valve)	OFF	Close



3.3 EBD Control Mode



In order to guarantee the operation stability, the EBD function is designed in such manner that front wheels are stopped ahead of the rear wheels. As the front brakes undertake more works than that of the rear brakes, it will cause that the rear wheels will be stopped firstly when apply with same braking pressure. In order to preventing the occurrence of above thing, a device to reduce the braking pressure applied on the rear wheels under certain pressure is required, of which this function is fulfilled by the pressure reducing valve (P-Valve). The special pressure reducing valve is not required for the vehicles equipped with ABS as the procedure supplemented to the ABS will fulfill the control function on the braking pressure of the rear wheels so as to effect the improvement of vehicle operation stability.

II. Removal and Installation

1. Spare Part Supply Status

① Differentiation between Dry Type HECU and Wet Type HECU

The biggest differentiation between the dry type HECU and wet type HECU is that the no air discharge is conducted in the 2nd circuit (namely the circuit from the normal close valve to the general pump) of the dry type HECU. Therefore, when the spare part is of wet type HECU, it's only necessary to conduct the air discharge and oil refill in accordance with the regular brake system after the replacement. When the spare part is of dry type HECU, besides that the air discharge and oil refill are required in accordance with the regular brake system after the replacement, it's necessary to conduct the air discharge and oil refill to the 2nd circuit of the HECU. In addition, for the appearance, the wet type HECU has the bolts for sealing purpose and the dry type HECU has the protection film. The product label located on the motor is marked with the part number of the products, through which the dry type HECU and wet type HECU can be differentiated.

Take the S21 model for instance, the dry type Mando product number is BH601-086-00 and the wet type Mando product number is BH602-386-00.

Dry Type

Wet Type

② Notices

If the bolts on the wet type HECU are fallen off (such as during the transportation), besides that the air discharge and oil refill must be conducted for 1st circuit, maybe it's necessary to conduct the air discharge and oil refill to the 2nd circuit.

2. Notices for Removal and Installation

① Notices for HECU Assembling

During the assembling of brake pipeline:

- † Remove the protection film attached onto the HECU before the operation.
- † Confirm the pipeline of general pump and wheel branch pump before the operation.

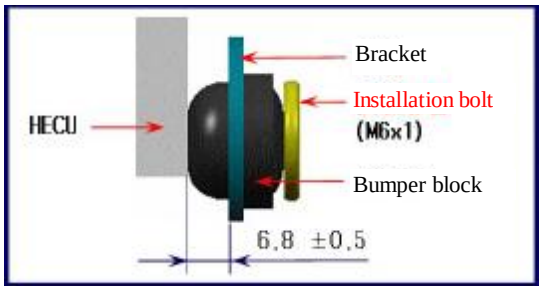
  (General pump: MCP, MCS Wheel branch pump: FR, FL, RR, RL)
- † Confirm if the brake hose is tightened to 120~160 kgf·cm with special tool or torque wrench.
- † Notice to keep away the impurity ingress into the HECU hole and brake hose during operation.

② Notices for HECU Bracket Assembling

During the assembling of HECU bracket:

† During the tightening of the bolt (3 pcs), it may cause the incorrect assembling due to the friction resistance of the cushion pad. It's preferable to use the lubricating oil with the physical properties that will not impair the cushion pad.

† Insert the bolts (3 pcs) onto the cushion pad installed onto the bracket before install to the HECU, which will help the operation.



† Confirm if the bolts (3 pcs) are tightened to 80~100 kgf·cm with special tool or torque wrench.

③ Notices for Installation of HECU and Bracket Assembly

During the installation to vehicle body:

† Attach the components of brake hose and bracket to the HECU and install to the vehicle body with the body fixing bolts.

† Confirm if the body fixing bolts are tightened to 190~260 kgf·cm with special tool or torque wrench.

† Again confirm if the pipeline installation of general pump and wheel branch pump is correct.

(General pump: MCP, MCS; Wheel branch pump: FR, FL, RR, RL)

† Tighten the brake hose not fully tightened to the specified torque (120 ~ 160 kgf·cm) with special tool or torque wrench.

④ Other Notices

† Find out the trouble cause with diagnosis instrument before repair.

† The package of the spare parts should be unwrapped only before the installation.

† Only use the parts supplied by the original manufacturer.

† Notice the cleanliness during removal and only use the non-fuzz cloth for cleaning.

† Use the detergent not containing the mineral oil to clean the appearance before removal.

† Do not use the compressed air or move the vehicle when the system is opened.

† After the removal of the ABS assembly, plug various hydraulic outlets with plugs as soon as possible.

† Remove other components interfering the operation.

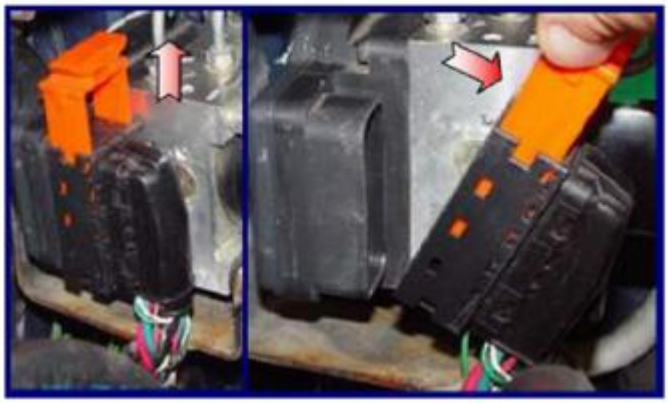
† Use DOT#3 brake liquid.

† Immerse the seals with brake liquid, instead of engine oil or braking ointment.

† Check all hydraulic connectors for leakage.

3. HECU Replacement

① When the vehicle is stopped, remove the 25-pin connector and harness wiring of the HECU located within the engine compartment.



25-Pin Connector Used in MGH-25 ABS

(P/No：AMP 368482-1)

② Screw off in counter clockwise direction the 6 bolts (M10x1.0) connected to the HECU brake hose with 11mm tool (wrench) (rotate in clockwise direction during refit). The tightening torque for the brake hose is 120 ~ 160 kgf·cm.

③ Screw off in counter clockwise direction the 3 bolts or nuts connected to the bracket with 12mm tool (wrench) (rotate in clockwise direction during refit). The tightening torque for the fixing bolts or nuts of the bracket is 190 ~ 260 kgf·cm.

④ After the removal of the product, screw off in counter clockwise direction the 3 embedded bolts (M6x1.0) attached to the HECU with 5mm tool (hex wrench) (see the figure in next page).

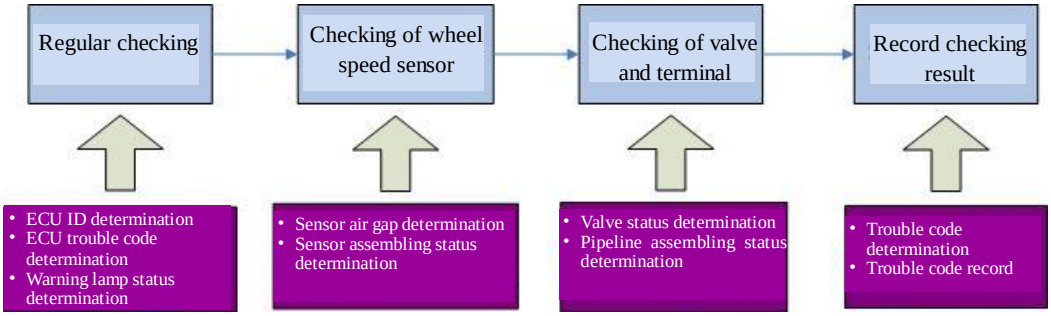
⑤ Screw off in counter clockwise direction the 6 bolts from the after-service HECU with 6mm tool (hex wrench).

⑥ Screw on in clockwise direction 3 embedded bolts to assemble the after-service HECU and the bracket with 5mm tool (hex wrench). The tightening torque for the embedded bolts is 80 ~ 100 kgf·cm.

⑦ With reference to above item ①~ ③, install the replacement after-service HECU to the vehicle in reverse order.

III. Trouble Diagnosis and Troubleshooting

1. Checking Sequence


Regular checking
Checking of wheel speed sensor
Checking of valve and terminal
Record checking result
• ECU ID determination
• ECU trouble code determination
• Warning lamp status determination
• Sensor air gap determination
• Sensor assembling status determination
• Valve status determination
• Pipeline assembling status determination
• Trouble code determination
• Trouble code record

2. Trouble Diagnosis and Troubleshooting of MGH-25 ABS

2.1 Checking of ABS and EBD Warning Lamp

Check if the ABS and EBD warning lamps are illuminated in accordance with following:

① Rotate the vehicle key to turn on the power. The ABS warning lamp will illuminate and then go off in 3s.

② It indicates the trouble if the status mentioned in ① is not present and it's necessary to check the trouble code with reference to the trouble code checklist.

③ If the warning lamps are completely not illuminated, please refer to the trouble checklist without trouble code.

2.2 Table for Common Troubles

Position	Cause	Structure	Warning lamp	
			ABS	**EBD**
Vehicle harness	Incorrect assembling of brake hose	Locked wheels and brake off-tracking	Off	Off
	Brake oil leakage	Poor start of ABS and EBD		
	Incorrect wiring installation	Brake failure		
	Air discharge trouble	Deteriorated ABS performance		
Motor	Motor trouble	ABS start failure	On	Off
ECU	Trouble of ECU power line	Start failure of ABS and EBD	On	On
	Trouble of valve power line	Start failure of ABS and EBD		
	Poor grounding of ECU	Start failure of ABS and EBD		
	ECU trouble	Start failure of ABS and EBD		
	Trouble of motor wire line	ABS start failure	On	Off
Speed sensor	Sensor open-circuit/short-circuit	In event of whichever trouble: ABS start failure	On	Off
		In event of both troubles: Start failure of ABS/EBD	On	On
	Gear ring trouble, sensor interference trouble, air gap trouble	In event of whichever trouble: Incorrect start of ABS	On	Off
		In event of both troubles: Start failure of ABS/EBD	On	On

2.3 Trouble Code Readout and Deletion without Trouble Diagnosis Instrument

① Purpose and condition of trouble code readout without trouble diagnosis instrument

If without the trouble diagnosis instrument, it may display the trouble status of the ABS via the ABS warning lamp and read out the trouble code to facilitate the trouble determination and troubleshooting. In such case, the trouble code will be displayed in 2-digit number. Please refer to the numbers in parentheses in the trouble checklist of trouble code in succeeding section 2.4.

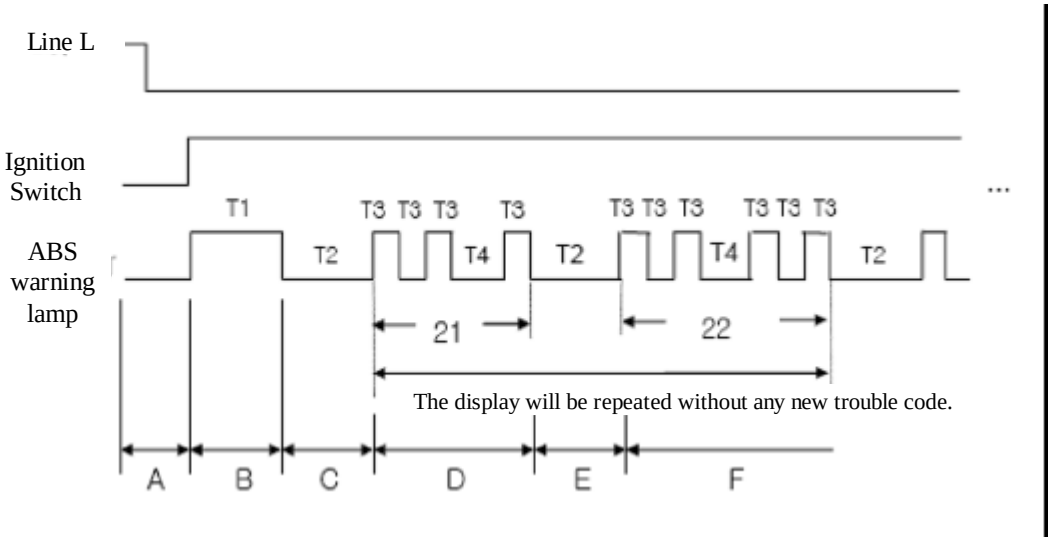
The service conditions are as follows:

† Vehicle speed below 2km/h;
† Without connection of trouble diagnosis instrument;
† The line L (namely the pin 7 of interior diagnosis socket) should be always grounded during the diagnosis process.

In addition, at finish of the trouble code readout, restore the ECU status of the ABS to the normal mode (previously, it's the diagnosis status), of which the method is as follows: At finish of the diagnosis operation, disconnect the grounding status of the line L, rotate the key to power off status, and then re-connect.

② Readout method of trouble code without trouble diagnosis instrument

Read out the trouble code in accordance with following procedure when the service conditions for trouble code readout without trouble diagnosis instrument are met:



The steps in above figure are respectively:

A. Rotate the vehicle key to power on position after the line L is grounded;

B. When the ABS warning lamp illuminates and lasts for 3s, it indicates the start of diagnosis;

C. When the ABS warning lamp is off for 3s, it indicates that it enters into the trouble code display phase;

D. Trouble code display and readout;

E. When the ABS warning lamp is off for 3s, it indicates that it enters into next trouble display phase or circulated display phase;

F. The display and readout of new trouble code and the circulated display of last trouble code.

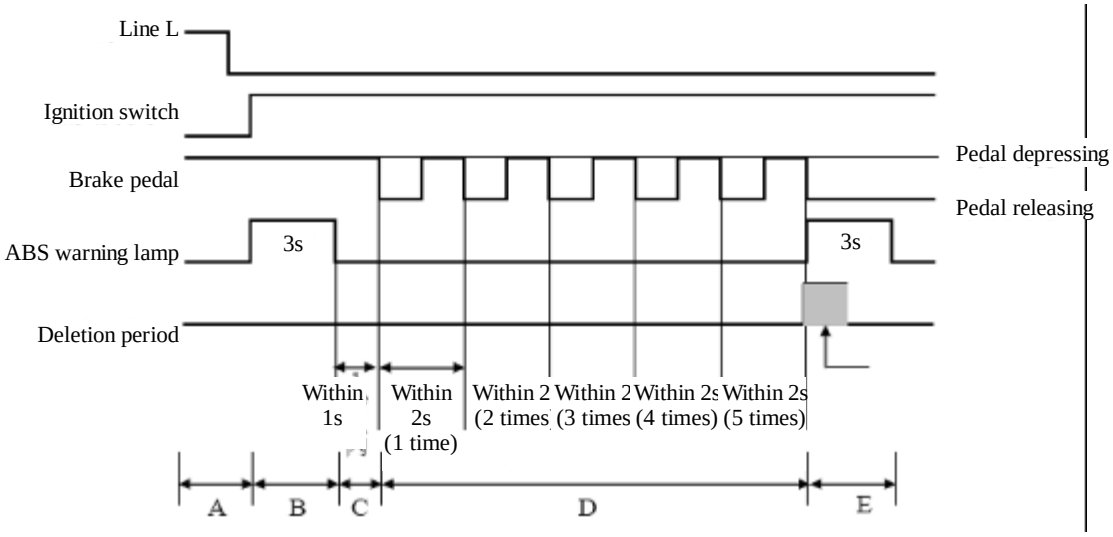
The meaning of symbols in the figure is as follows:

Code	Symbol Description	Duration
T1	The symbol for diagnosis start. The warning lamp starts flashing	3.0s
T2	For differentiation of the duration of various trouble codes during the display of multi trouble codes	3.0s
T3	Flashing interval of warning lamp at the presence of trouble code	0.5s
T4	For differentiation of the interval of various digits of trouble code during the display of certain trouble code (for this interval, the first digit is for tens digit and the second digit is for ones digit)	1.5s

Take the process shown in above figure for instance. Within the display span of the first trouble code, before the presence of T4 (namely, 1.5s before the off of the warning lamp), since the warning lamp flashes twice (the duration for each on and off is both T3, namely 0.5s), the first digit of the 2-digit trouble code (tens digit) is at 2; after the presence of T4 (namely 1.5s after the off of the warning lamp), since the warning lamp flashes once, the second digit of the 2-digit trouble code (ones digit) is at 1. After that, the warning lamp will be off for 3s (namely T2 duration). Therefore, the display of first trouble code is completed with the trouble code of 21. The detailed description of the trouble is shown in the trouble code checklist in section 2.4. Also, the second trouble code of 22 can be obtained.

③ Deletion of trouble code without trouble diagnosis instrument

After the trouble code readout and troubleshooting based on the trouble code checklist, it's necessary to delete the previous trouble code before the re-checking of the trouble code. The condition for trouble code deletion is same with that of the trouble code readout. The detailed operation method is as follows:



The steps in the above figure are respectively as follows:

A. After the brake pedal is depressed, ground the line L and rotate the vehicle key to the power on position;

B. The ABS warning lamp illumination and go off in 3s;

C. Start to release the pedal within 1s after the ABS warning lamp goes off;

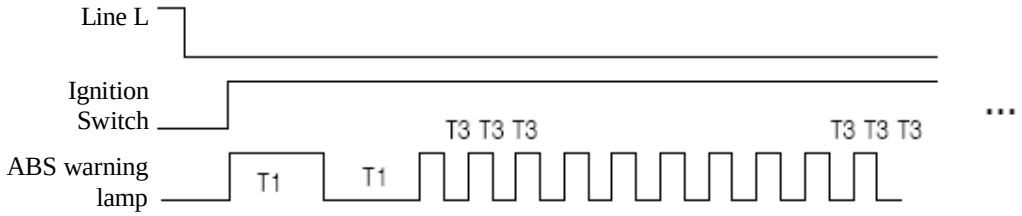
D. After the pedal is released for approximate 1s, re-depress the pedal for approximate 1s. Repeat the above operation for 5 times. During this operation, the warning lamp will not be illuminated;

E. The ABS warning lamp illuminates and lasts for 3s. During this period, the trouble code within this process will be deleted.

At the finish of the trouble code deletion, restore the ECU status of the ABS to the normal mode,

of which the operation method is same with that of the trouble code diagnosis.

In addition, when the ECU of the ABS has no trouble code, ground the line L and rotate the key to the power on position. The flashing of the ABS warning lamp is conducted in accordance with the type in following figure, of which the symbol meaning is same with the foregoing section.



2.4 Trouble Checklist of Trouble Code

① Contents of Trouble Code

Trouble code	Contents	Trouble code	Contents
C1 200 (11)	Open-circuit/short-circuit of left front sensor	C1 206 (31)	Open-circuit/short-circuit of left rear sensor
C1 201 (12)	Interference of left front sensor or gear ring	C1 207 (32)	Interference of left rear sensor or gear ring
C1 202 (13)	Air gap error of left front sensor	C1 208 (33)	Air gap error of left rear sensor
C1 203 (21)	Open-circuit/short-circuit of right front sensor	C1 209 (41)	Open-circuit/short-circuit of right rear sensor
C1 204 (22)	Interference of right front sensor or gear ring	C1 210 (42)	Interference of right rear sensor or gear ring
C1 205 (23)	Air gap error of right front sensor	C1 211 (43)	Air gap error of right rear sensor
C1 101 (51)	Battery voltage too high (above 17V)	C2 112 (54)	Trouble of electromagnetic valve fuse or electromagnetic relay
C1 102 (52)	Battery voltage too low (below 9.4V)	C2 402 (55)	Trouble of motor fuse or motor
C1 604 (53)	Trouble of ECU internal circuit or electromagnetic valve coil		

② Trouble checklist of trouble code

Table 1

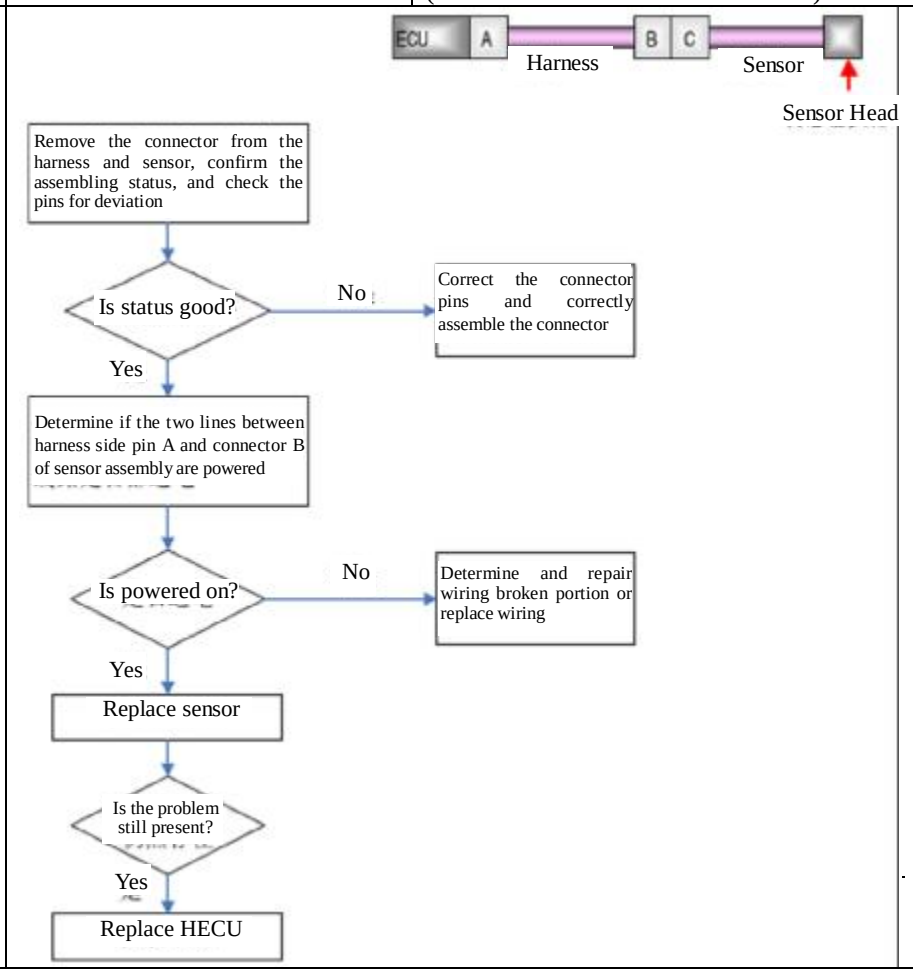
Trouble Code	C1 200(11) C1 203(21) C1 206(31) C1 209(41)	Note: If the malfunctions corresponding to more than 2 trouble codes can be determined, after the trouble codes are deleted (erasable trouble codes), drive the vehicle to above 40km/h to determine the malfunctions to that the trouble codes correspond and check in accordance with the registered trouble codes (determine the same one trouble code).
Possible Case	Open-circuit/short-circuit of sensor: At short-circuit or open-circuit of battery anode or cathode of sensor.	
Troubleshooting Flow		

Table 2

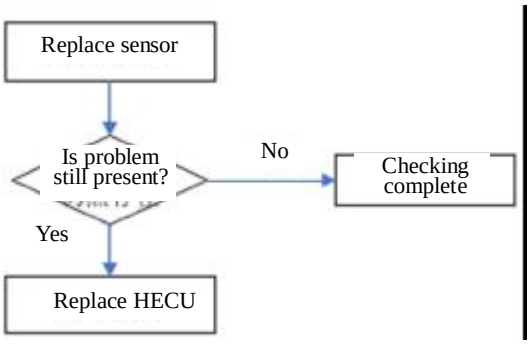
Trouble Code	C1 202(13) C1 205(23) C1 208(33) C1 211(43)	Note: ①The air gap refers to the gap between the gear ring and the sensor; ② If the malfunctions corresponding to more than 2 trouble codes can be determined, after the trouble codes are deleted (erasable trouble codes), drive the vehicle to above 40km/h to determine the malfunctions to that the trouble codes correspond and check in accordance with the registered trouble codes (determine the same one trouble code).
Possible Case	Air gap error: Air gap too big or self short-circuit of sensor (resistance value at 0) that results no signal or the gear ring not properly installed.	
Troubleshooting Flow		

Table 3

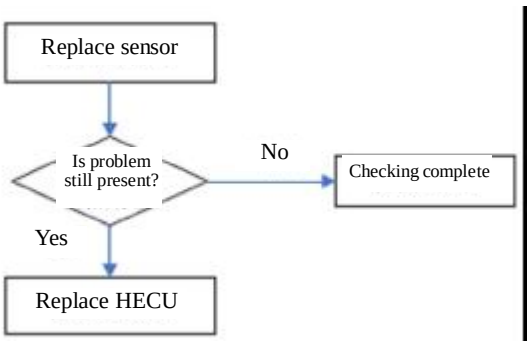
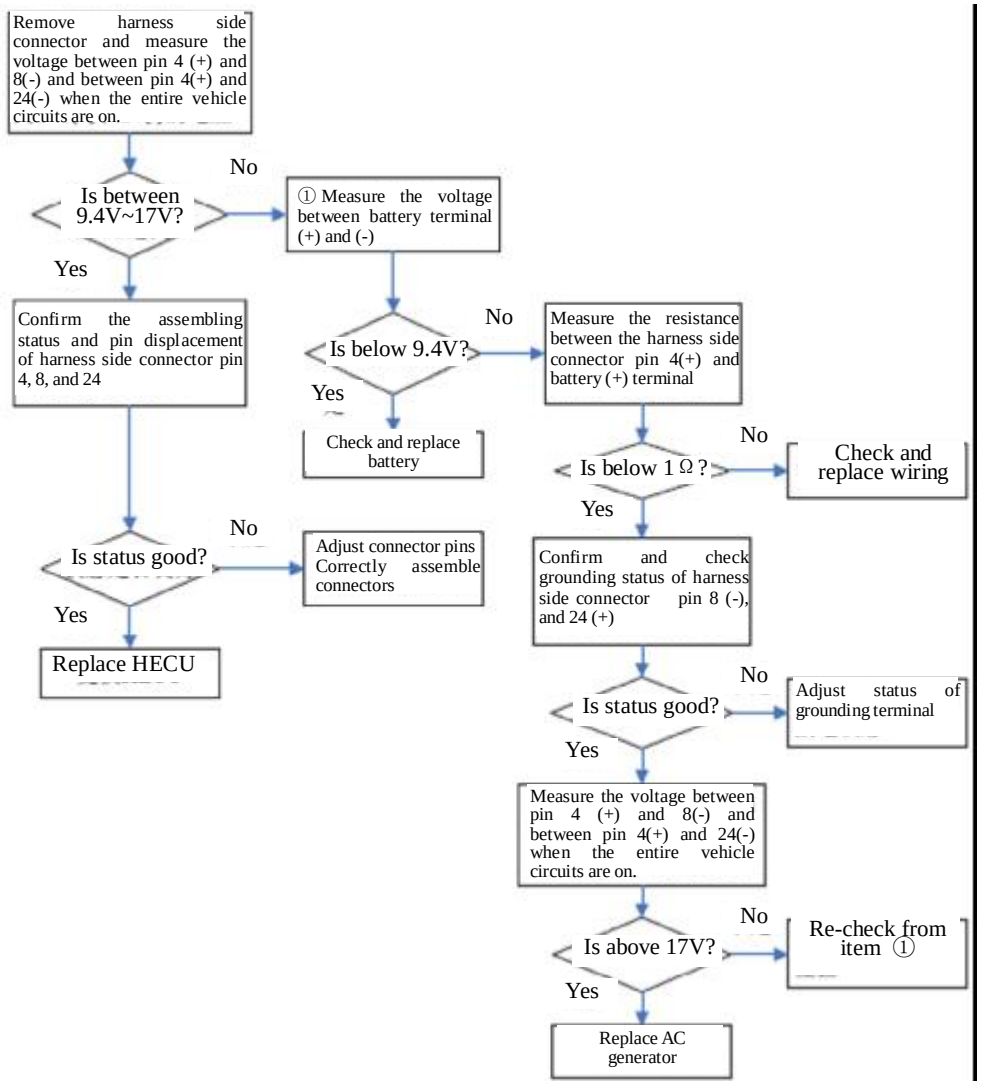
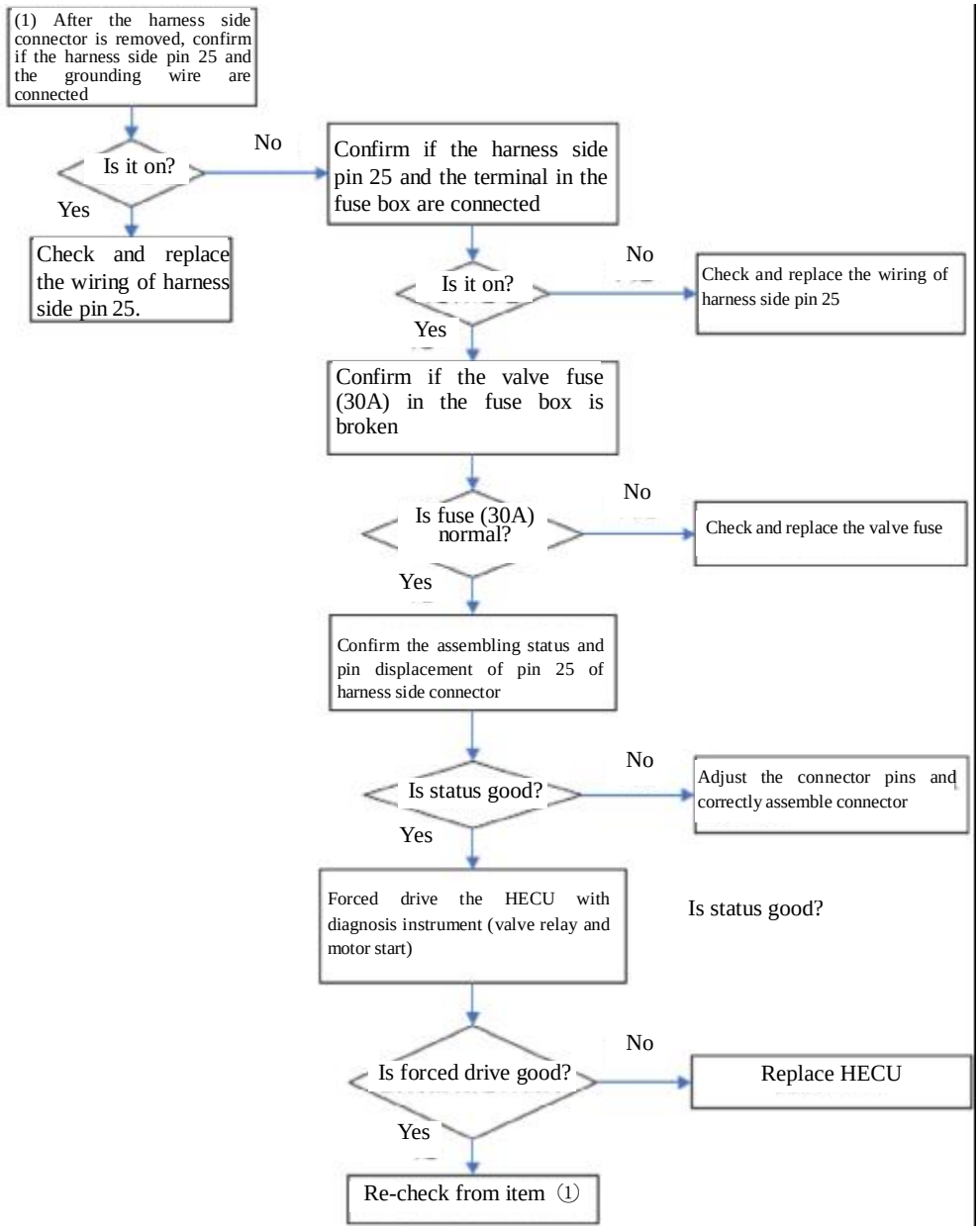
<table>
<tr><td>Trouble Code</td><td>C1 201(12) C1 204(22)
C1 207(32) C1 210(42)</td><td rowspan="2">Note: ① The sensor signal is not uniform when the gears are adhered with engine oil and the impurities such as slag;
② The air gap refers to the air gap between the gear ring and the sensor;
③ If the malfunctions corresponding to more than 2 trouble codes can be determined, after the trouble codes are deleted (erasable trouble codes), drive the vehicle to above 40km/h to determine the malfunctions to that the trouble codes correspond and check in accordance with the registered trouble codes (determine the same one trouble code).</td></tr>
<tr><td>Possible Cause</td><td>Interference of gear ring or sensor: Occurred when installed with non-standard specification gear rings.</td></tr>
<tr><td>Troubleshooting Flow</td><td colspan="2"> 
</td></tr>
</table>

Table 4

Trouble Code	C1 101(51) C1 102(52)	Note: If the malfunctions corresponding to more than 2 trouble codes can be determined, after the trouble codes are deleted (erasable trouble codes), drive the vehicle to above 40km/h to determine the malfunctions to that the trouble codes correspond and check in accordance with the registered trouble codes (determine the same one trouble code).
Possible Cause	Abnormal battery voltage: Occurred when the voltage is too high or too low	
Troubleshooting Flow		

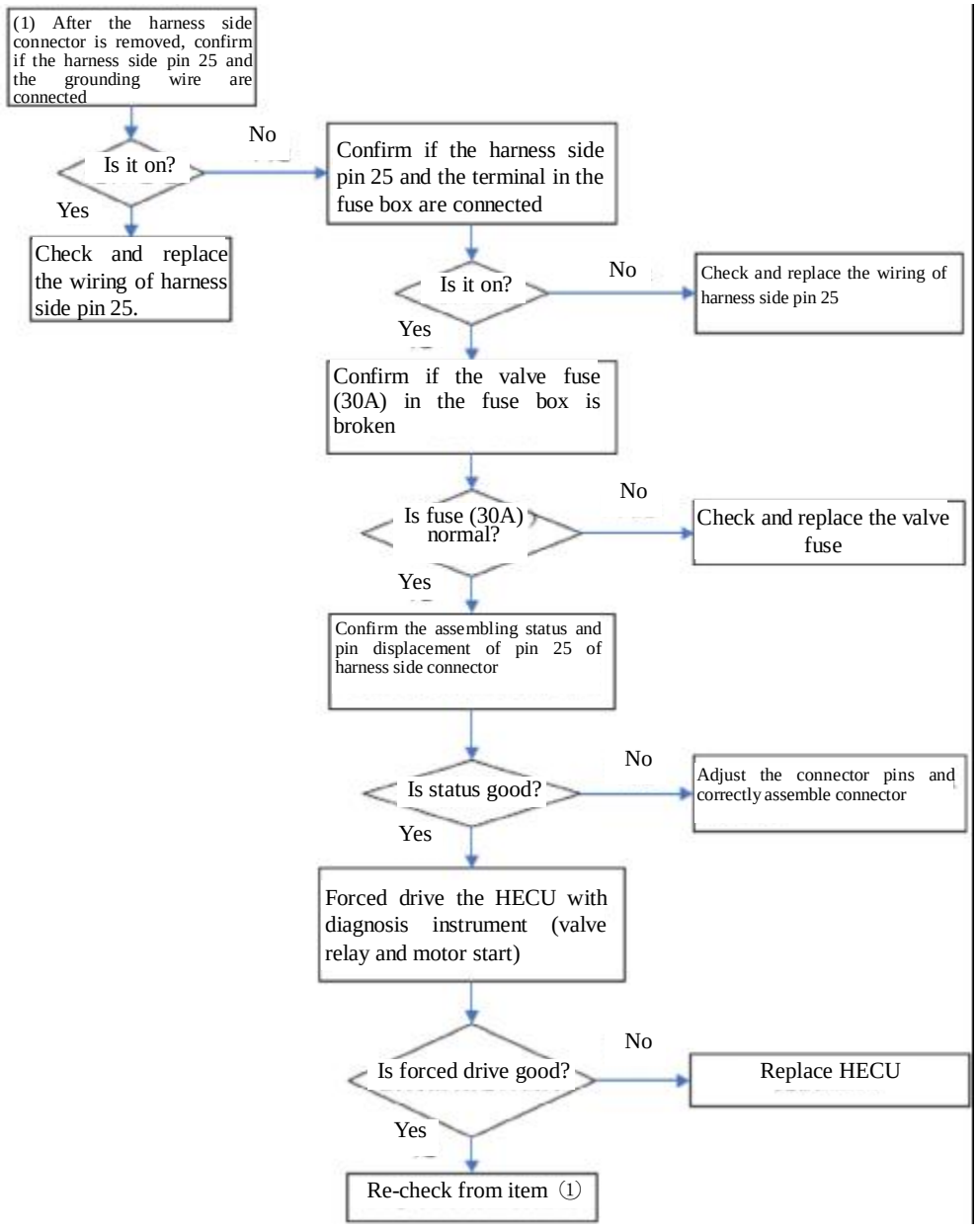
Remove harness side connector and measure the voltage between pin 4 (+) and 8(-) and between pin 4(+) and 24(-) when the entire vehicle circuits are on.
Is between 9.4V~17V?
No
① Measure the voltage between battery terminal (+) and (-)
Yes
Confirm the assembling status and pin displacement of harness side connector pin 4, 8, and 24
Is below 9.4V?
No
Measure the resistance between the harness side connector pin 4(+) and battery (+) terminal
Yes
Check and replace battery
Is below 1 Ω ?
No
Check and replace wiring
Yes
Is status good?
No
Adjust connector pins Correctly assemble connectors
Yes
Replace HECU
Confirm and check grounding status of harness side connector pin 8 (-), and 24 (+)
Is status good?
No
Adjust status of grounding terminal
Yes
Measure the voltage between pin 4 (+) and 8(-) and between pin 4(+) and 24(-) when the entire vehicle circuits are on.
Is above 17V?
No
Re-check from item ①
Yes
Replace AC generator

Table 5

Trouble Code	C2 402(55)	Note: If the malfunctions corresponding to more than 2 trouble codes can be determined, after the trouble codes are deleted (erasable trouble codes), drive the vehicle to above 40km/h to determine the malfunctions to that the trouble codes correspond and check in accordance with the registered trouble codes (determine the same one trouble code).
Possible Cause	Malfunction of motor fuse/motor	
Troubleshooting Flow		

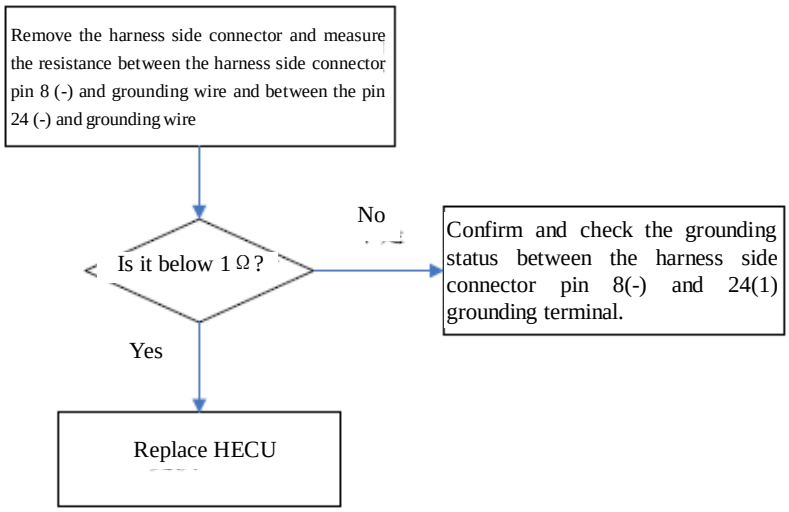
(1) After the harness side connector is removed, confirm if the harness side pin 25 and the grounding wire are connected
Is it on?
No
Yes
Confirm if the harness side pin 25 and the terminal in the fuse box are connected
Check and replace the wiring of harness side pin 25.
Is it on?
No
Check and replace the wiring of harness side pin 25
Yes
Confirm if the valve fuse (30A) in the fuse box is broken
Is fuse (30A) normal?
No
Check and replace the valve fuse
Yes
Confirm the assembling status and pin displacement of pin 25 of harness side connector
Is status good?
No
Adjust the connector pins and correctly assemble connector
Yes
Forced drive the HECU with diagnosis instrument (valve relay and motor start)
Is status good?
Is forced drive good?
No
Replace HECU
Yes
Re-check from item ①

Table 6

Trouble Code	C2 112(54)	Note: If the malfunctions corresponding to more than 2 trouble codes can be determined, after the trouble codes are deleted (erasable trouble codes), drive the vehicle to above 40km/h to determine the malfunctions to that the trouble codes correspond and check in accordance with the registered trouble codes (determine the same one trouble code).
Possible Cause	Malfunction of valve fuse and relay: a) Broken of primary relay or fuse b) Short-circuit of primary relay	
Troubleshooting Flow		

(1) After the harness side connector is removed, confirm if the harness side pin 25 and the grounding wire are connected
Is it on?
No
Confirm if the harness side pin 25 and the terminal in the fuse box are connected
Yes
Check and replace the wiring of harness side pin 25.
Is it on?
No
Check and replace the wiring of harness side pin 25
Yes
Confirm if the valve fuse (30A) in the fuse box is broken
Is fuse (30A) normal?
No
Check and replace the valve fuse
Yes
Confirm the assembling status and pin displacement of pin 25 of harness side connector
Is status good?
No
Adjust the connector pins and correctly assemble connector
Yes
Forced drive the HECU with diagnosis instrument (valve relay and motor start)
Is forced drive good?
No
Replace HECU
Yes
Re-check from item ①

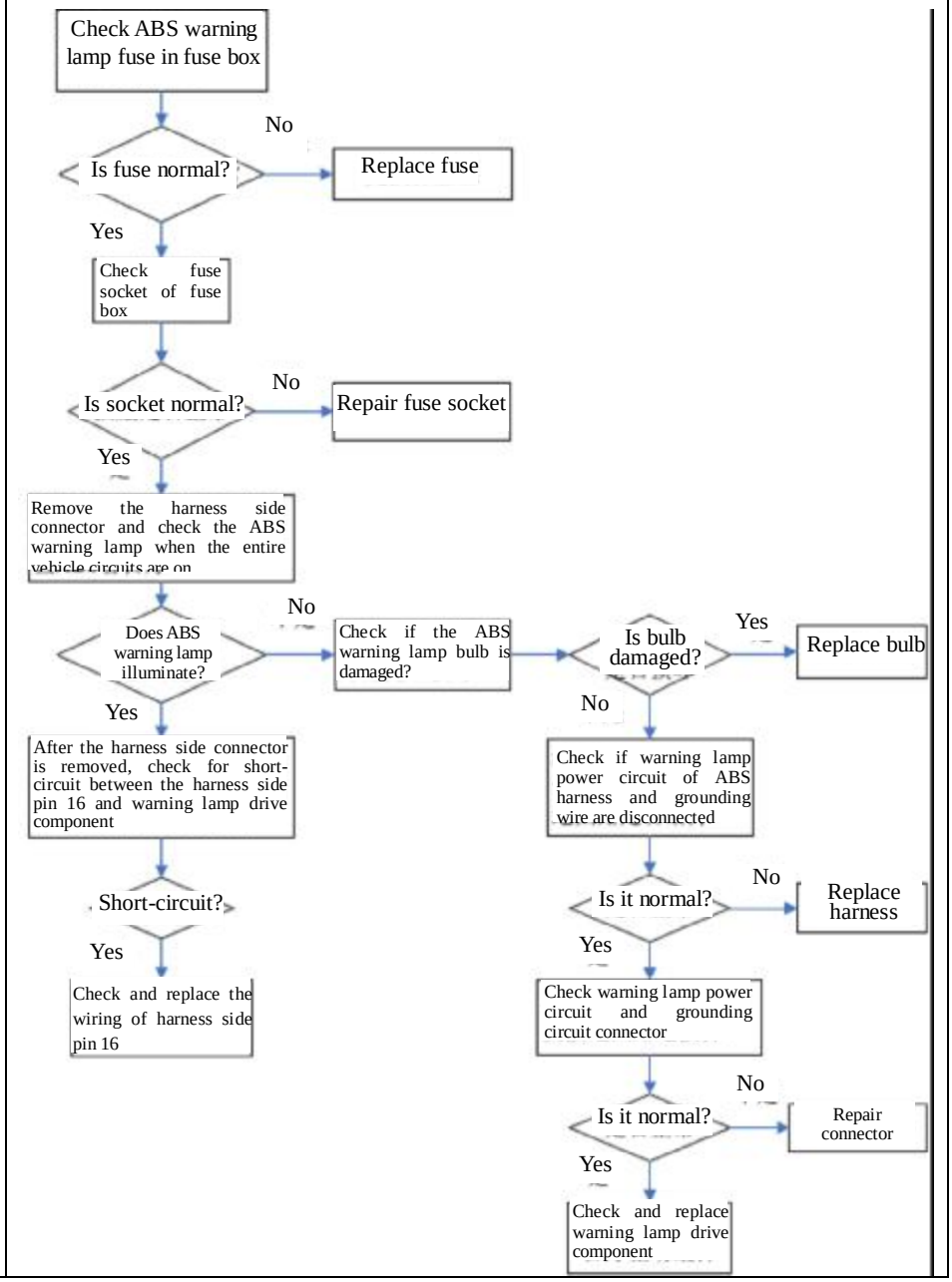
Table 7

Trouble Code	C1 604(53)	Note: If the malfunctions corresponding to more than 2 trouble codes can be determined, after the trouble codes are deleted (erasable trouble codes), drive the vehicle to above 40km/h to determine the malfunctions to that the trouble codes correspond and check in accordance with the registered trouble codes (determine the same one trouble code).
Possible Cause	Malfunction of ECU internal circuit and valve coil	
Troubleshooting Flow		

Remove the harness side connector and measure the resistance between the harness side connector pin 8 (-) and grounding wire and between the pin 24 (-) and grounding wire
Is it below 1 Ω ?
No
Confirm and check the grounding status between the harness side connector pin 8(-) and 24(1) grounding terminal.
Yes
Replace HECU

2.5 Trouble Checklist without Trouble Code

Table 1

Trouble Evidence	The ABS warning lamp doesn't illuminate when the engine is started	
Possible Cause	• Burn of fuse • Open-circuit of power line	• Burn of ABS warning lamp bulb • Damage of ABS warning lamp control
Troubleshooting Flow		

Check ABS warning lamp fuse in fuse box
Is fuse normal?
No
Replace fuse
Yes
Check fuse socket of fuse box
Is socket normal?
No
Repair fuse socket
Yes
Remove the harness side connector and check the ABS warning lamp when the entire vehicle circuits are on
Does ABS warning lamp illuminate?
No
Check if the ABS warning lamp bulb is damaged?
Is bulb damaged?
Yes
Replace bulb
Yes
After the harness side connector is removed, check for short-circuit between the harness side pin 16 and warning lamp drive component
No
Check if warning lamp power circuit of ABS harness and grounding wire are disconnected
Short-circuit?
Yes
Check and replace the wiring of harness side pin 16
Is it normal?
No
Replace harness
Yes
Check warning lamp power circuit and grounding circuit connector
Is it normal?
No
Repair connector
Yes
Check and replace warning lamp drive component

Table 2

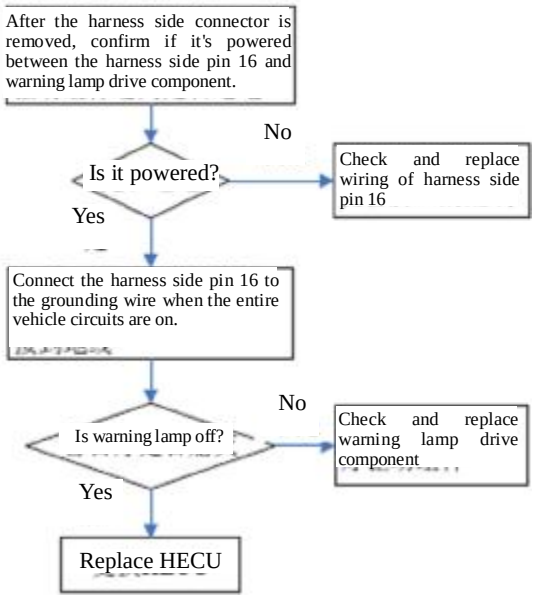
Trouble Evidence	The ABS warning lamp constantly illuminates after the vehicle start
Possible Cause	● Damage of ABS warning lamp control ● Open-circuit of ABS warning lamp control circuit ● ECU damage of ABS
Troubleshooting Flow	

Table 3

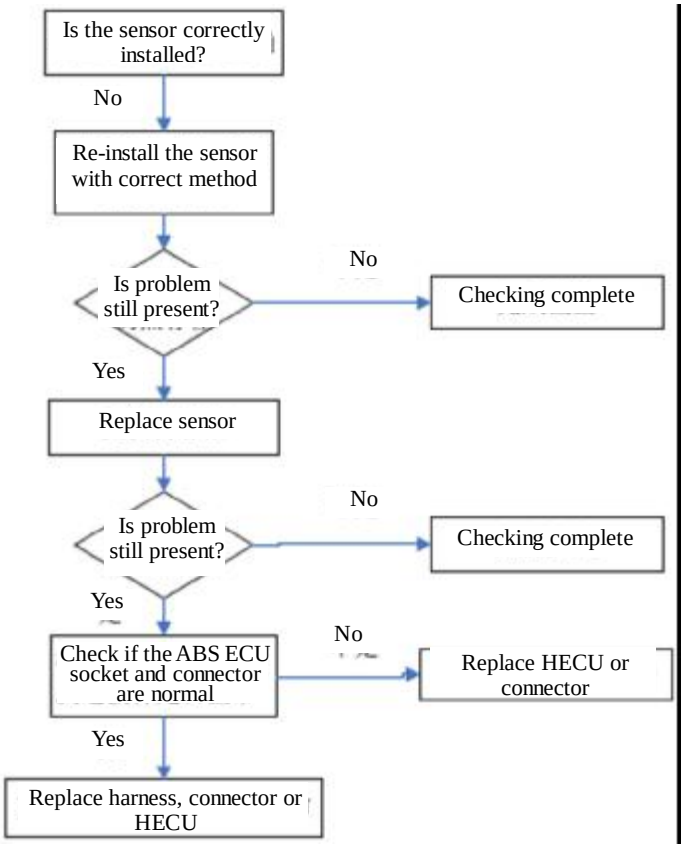
Trouble Evidence	Abnormal functioning of ABS
Possible Cause	● Damage of sensor ● Improper installation of sensor ● Problem of sensor harness ● Impurity adherence on sensor ● Damage of gear ring ● Damage of wheel bearing ● HCU damage of ABS ● ECU damage of ABS
Troubleshooting Flow	

Table 4

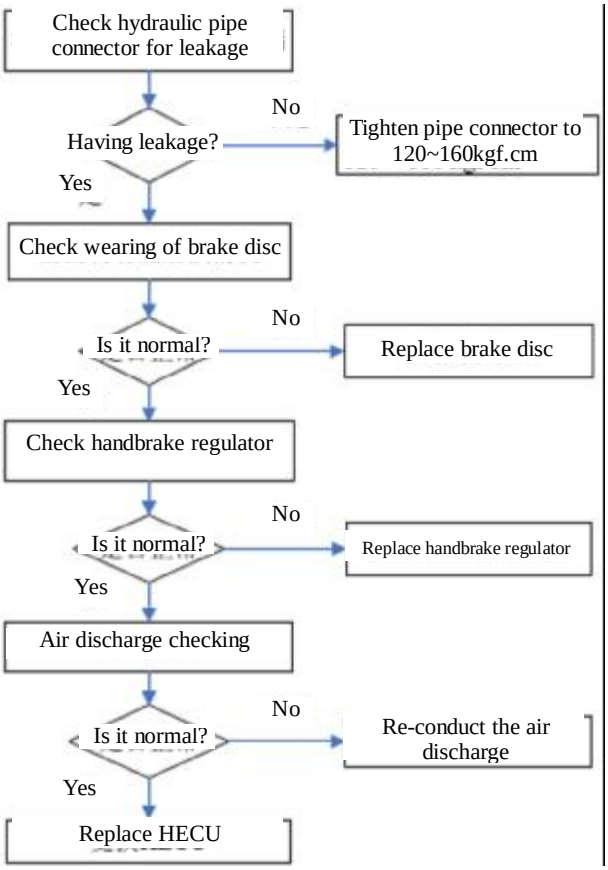
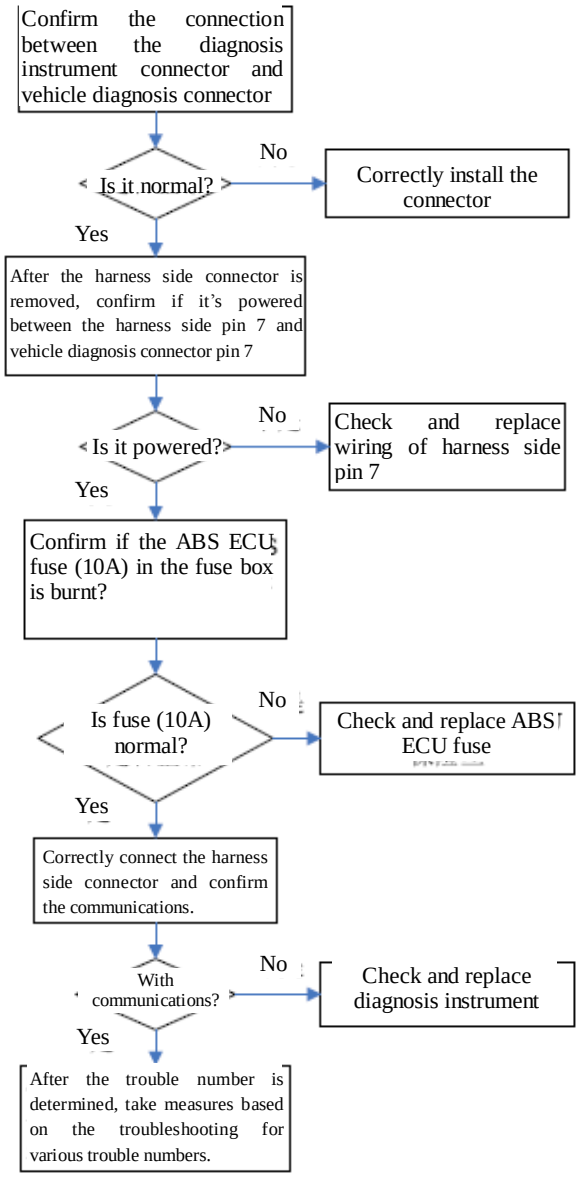
Trouble Evidence	Brake pedal travel too long
Possible Cause	● Improper adjustment of handbrake ● Leakage of brake liquid ● Severe wearing of brake friction disc ● Leakage of normal close valve ● Air in the system
Troubleshooting Flow	

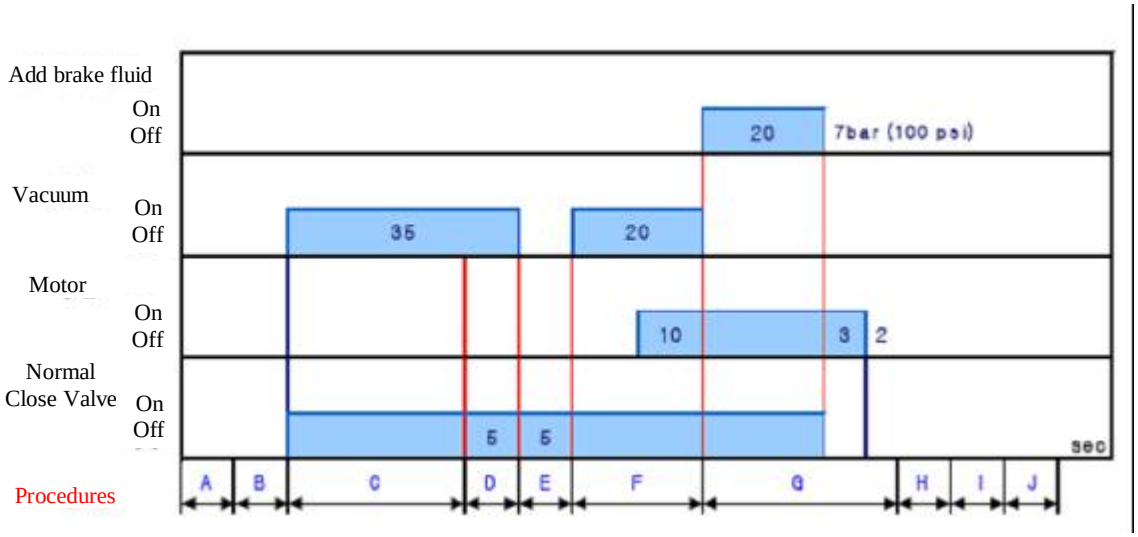
Table 5

Trouble Evidence	Without diagnosis code output (communication failure with trouble diagnosis instrument)
Possible Cause	● Problem of diagnosis instrument ● Burn of fuse ● Broken of diagnosis line or loosening of connector ● ECU damage of ABS
Troubleshooting Flow	

Confirm the connection between the diagnosis instrument connector and vehicle diagnosis connector
Is it normal?
No
Correctly install the connector
Yes
After the harness side connector is removed, confirm if it's powered between the harness side pin 7 and vehicle diagnosis connector pin 7
Is it powered?
No
Check and replace wiring of harness side pin 7
Yes
Confirm if the ABS ECU fuse (10A) in the fuse box is burnt?
Is fuse (10A) normal?
No
Check and replace ABS ECU fuse
Yes
Correctly connect the harness side connector and confirm the communications.
With communications?
No
Check and replace diagnosis instrument
Yes
After the trouble number is determined, take measures based on the troubleshooting for various trouble numbers.

IV. Air Discharge and Oil Refill

1. Regular Operation Procedure



The regular operation procedure of air discharge and oil refill is shown in the figure, of which:

A : Move the vacuum device and brake oil refill device;
B : Start after connected with vacuum and brake oil refill device and SDL;
C : Drive normal close electromagnetic valve and apply the 1st vacuum;
D : Excessive leakage test;
E : Minor leakage test after the 1st vacuum cut-off;
F : Applicable for 2nd vacuum and drive motor;
G : After the oil refill and maintaining of pressurization on the brake oil, relieve the brake oil pressure, stop the normal close electromagnetic valve and motor, and adjust the brake oil level;
H : Disconnect the vacuum device and brake liquid refiller;
I : Screw on the oil reservoir lid/disconnect the SDL;
J : Transfer to next step.

2. Checking Device

① The vacuum supplied to the oil reservoir should be as lower as possible, provided that the oil gun must supply at least below 1mm Hg vacuum.

② Confirm if the air discharge screw portion of the rear wheel hydraulic device (drum brake or brake caliper) forms the vacuum within the specified period. (It should be below 5~10mm Hg after connected with vacuum for 20~25s).

③ Confirm if the working voltage supplied to the HECU is at specified 10~12V.

④ Confirm the circulation time (C/T). Confirm the working time setting of the electromagnetic valve meets with the specified value.

- † C/T< 90: Run the electromagnetic valve continually;
- † 90≤C/T≥180: Start the electromagnetic valve for 2s and stop the electromagnetic valve for 2s. continually repeat above cycles;
- † C/T>180: The total running period setting of the electromagnetic valve is below 90s.

3. Notices for Air Discharge and Oil Refill

① During the refilling of brake oil, if the refilling pressure is not maintained for certain period or above, the oil level within the oil reservoir will lower at the finish of the refilling. Therefore, it's required to refill more brake oil or maintain the refilling pressure for certain period.

② The time period marked in the regular operations refers to the general circulation period.

③ The inside of after-service HECU is at moisture status, therefore, it may not conduct the air discharge mode operation (see succeeding item 5⑥ for the definition of air discharge mode) but directly conduct the air discharge operation on all wheels (However, in order to meet with the performance and pedal comfort, it's preferable to conduct the air discharge mode operation).

④ During the air discharge mode operation, the voltage supplied to HECU is preferably at 10~12V. However, during the use of checking devices, it will be OK to use the vehicle amounted battery. (The repeated air discharge mode operation with high voltage may damage the coil of ECU components).

4. Determination Method for Vehicles with Air Discharge Trouble

Differentiation / Category	ECU functioning or not	Leakage test		Note
		Excessive leakage	Minor leakage	
Case 1	Normal functioning	O.K	O.K	Normal functioning, no separate repetition required
Case 2	Normal functioning	O.K	N.G	Abnormal functioning, separate repetition required
Case 3	Normal functioning	N.G	N.G	Abnormal functioning, separate repetition required
Case 4	Not functioning	O.K	O.K	Abnormal functioning, separate repetition required
Case 5	Not functioning	O.K	N.G	Abnormal functioning, separate repetition required
Case 6	Not functioning	N.G	N.G	Abnormal functioning, separate repetition required

† Case 1 : The status at finish of normal functioning.
† Case 2 : The status that the connection of brake (HECU hole portion/brake pipe/brake hose) is poor and therefore needs rework.
† Case 3 : The status same with Case 2, but it may cause the status incapable of repetition when the leakage is really severe.
† Case 4 : Internal circuit air discharge trouble of HECU. It's the status necessary for repetition as the ABS may cause the sponge phenomenon after functioning for one time.
† Case 5 : The comprehensive trouble of Case 2 and Case 4. The status necessary for repetition.
† Case 6: The status similar to Case 5, but it may cause the status incapable of repetition when the leakage is really severe.

5. Measures in Event of Troubles during Air Discharge and Oil Refill (for internal dry status of brake system)

① Implementation of trouble determination. It's required to determine the connection portions of all components from the general pump to the wheel branch pump: HECU hole portion, connection portion of brake pipe, connection portion of brake hose, brake caliper and the air discharge screw portion of brake, and etc.

② After the determination of the trouble, re-assemble in accordance with the provisions in order to avoid the further occurrence of leakage.

③ Connect the repetition device to the 25-pin connector of the ECU or connect the checking device to the line K (pin 7). Use the specific wiring to connect to the connectors. During the connection to line K (pin 7), make the vehicle at power on or start status. The oil reservoir of the general pump is connected with the device for continual supply of brake oil or it's required that the oil reservoir should have enough oil during the supply of brake oil.

④. Check the HECU with repetition device or checking device and determine the existence of trouble code. If with trouble code, firstly conduct the operation for deletion of the trouble code (if the trouble in above item ① is not determined, it's necessary to determine the existence of trouble code). When the trouble code can't be deleted, operate with reference to the Trouble Checklist of Trouble Code in section 2.4 (In case of trouble of HU, motor and ECU, the air discharge and oil refill can't be conducted at the inside of the HECU).

⑤ After the brake pedal is depressed, open the air discharge screw attached onto the wheel brake caliper or drum brake to discharge the air. Conduct this operation on all wheels, till that the brake oil discharged from the air discharge screw is free of air and the brake pedal is properly rigid. Refer to the operation in item ⑩ in using the repetition device capable of vacuum formation and refilling of brake liquid.

⑥ Conduct the air discharge mode by means of the repetition device or the checking device. If there has no reaction force when the brake pedal is depressed, then repeat the operation of pedal depressing and pedal releasing, till the air discharge mode is completed (air discharge mode: repeat the start in 2s interval, stop the normal close valve of HECU for 1min, and continually drive the motor. The repeated operation of pedal depressing and pedal releasing is conducted within the period of normal close electromagnetic valve and motor drive).

⑦ The operation in item ⑤ (air discharge) should be repeated for all wheels.

⑧ Measure the brake pedal travel. If not meet with the provisions, repeat the operations in item ⑥ (air discharge mode) and item ⑤ (air discharge). If the brake pedal travel doesn't meet with the provisions after the air discharge mode and air discharge are repeated for above 10 times, replace with after-service HECU (wet type) and then repeat the operations from the beginning.

⑨ Connect the repetition device and checking device to the HECU and again determine the existence of trouble code. If with trouble code, delete the trouble code and then disconnect the repetition device or checking device.

⑩ During the use of other repetition devices (the equipment capable of vacuum formation and liquid refilling), the implementation method is as follows:

- † Conduct in accordance with the contents in above item ①～④;
- † When the vacuum pump is sufficiently driving for approximate 60s, the inside of brake system will form the vacuum status.
  - **C** Start the operation of air discharge mode in above item ⑥ 10s before the vacuum cut-off.
  - **C** Without the repeated operations of pedal depressing and pedal releasing.
- † Conduct the brake liquid refilling operation (above 7bar/100Psi) for above 20s at the same time of vacuum cut-off.
- † Complete the brake liquid refill and air discharge mode.
- † Conduct the operation based on the contents in above item ⑧～⑨.

6. Measures in Event of Trouble during Checking and ABS Functioning Test (for internal wet status of brake system)

① Connect the repetition device or checking device. The following conditions must be guaranteed:

- † Use the specific wiring while connecting to the 25-pin connector of ECU.
- † The vehicle should be at power on status or start status while connecting to line K (pin 7).
- † The oil reservoir of the general pump is connected with the device for continual supply of brake oil or it's required that the oil reservoir should have enough oil during the supply of brake liquid.

② Check the HECU with repetition device or checking device and determine if it has trouble code.

- † If with trouble code, firstly conduct the operation to delete the trouble code.
- † If the trouble code can't be deleted, implement with reference to section 2.4 "trouble checklist of trouble code" (If the HU, motor or ECU has trouble, the inside of HECU can't conduct the air discharge and oil refill).

③ After the brake pedal is depressed, open the air discharge screw attached on the wheel brake caliper or drum brake to discharge the internal air. It's required to conduct this operation on all wheels, till that the brake oil discharged from the air discharge screw is free of air and the brake pedal is properly rigid.

④ Conduct the air discharge mode by means of the repetition device or the checking device. If there has no reaction force when the brake pedal is depressed, then repeat the operation of pedal depressing and pedal releasing, till the air discharge mode is completed

⑤ The operation in item ③ (air discharge) should be repeated for all wheels.

⑥ Measure the brake pedal travel. If not meet with the provisions, repeat the operations in item ④ (air discharge mode) and item ③ (air discharge). If the brake pedal travel doesn't meet with the provisions after the air discharge mode and air discharge are repeated for above 10 times, replace with after-service HECU (wet type) and then repeat the operations from the beginning.

⑦ Connect the repetition device and checking device to the HECU and again determine the existence of trouble code. If with trouble code, delete the trouble code and then disconnect the repetition device or checking device.

Annex I Malfunction Cases and Incorrect Repair Cases

1. HECU Incorrect Repair Cases

① HECU replacement relating to ABS functioning noise

The HECU replacement case that deemed the noise of electromagnetic valve and motor as the malfunction during the functioning of the ABS.

- † During the functioning of ABS, the noise generated during the relieving or enhancing of the braking pressure on various wheels is of normal functioning status. The noise level will vary depending on the braking pressure applied on various wheels, other than the product malfunction. Therefore, we should persuade the customers to understand that.
- † When the vehicle reaches 10km/h speed at the first time after vehicle start, the sensitive customers may hear the noise at the time when the ECU diagnoses the motor drive, which is also the normal functioning of the ABS.

② HECU replacement relating to EBD functioning noise

The HECU replacement case that deemed the clattering noise of rear wheels that other than the ABS functioning noise during the braking as the malfunction.

- † The ABS is also equipped with EBD function, which will effect the relieving of braking pressure on the rear wheels when the rear wheels are locked ahead of the front wheels. The noise generated during the above mentioned process is of normal functioning status.

③ HECU replacement relating to braking off-tracking

HECU replacement case due to the vehicle braking off-tracking towards one side during the braking.

- † ABS is the braking assisted device that functioning in such manner that the ECU will calculate the speed of various wheels in order to maintain the best braking force and control stability during the braking. In the event of malfunction of the HECU, the ECU will illuminate the warning lamp by means of the diagnosis. Therefore, in the event of braking off-tracking without the illumination of ABS warning lamp, it's necessary to check other braking hydraulic devices.
- † In the event of incorrect assembling of the braking hose, the braking off-tracking may occur during the functioning of the ABS.

④ Replacement case that the ABS is functioning during barking at low speed (below 40km/h)

HECU and sensor replacement case that the ABS is always functioning during the braking at low speed.

- † During the braking at low speed, the ABS may also function depending on the road conditions and braking pressure. If the ABS is always functioning at each time, it's necessary to check if the sensor air gap of various wheels is too large, if it has interference with the gear ring, and if the tooth shape of the gear ring is damaged.
- † Air gap adjustment method. For the improper air gap, after the determination of the parts related to the problem, replace or grind the installation surface (junction portion) of the sensor to the specified air gap; in the event of interference, place the thin gasket onto the sensor installation surface so as to adjust to the specified air gap.

2. Incorrect Repair Cases for Wheel Speed Sensor

① Open-circuit and short-circuit related to sensor

The sensor replacement case without product checking when the ABS warning lamp is illuminated and the trouble code of the vehicle is determined.

- † The ABS trouble code is prepared based on the ABS products. Therefore, during the open-circuit or short-circuit of the sensor, it's necessary to conduct the problem checking, such as confirm the connection status from the ECU to the wiring and connectors of the sensor, measure the sensor resistance, and etc. During the malfunction checking of sensor, it's preferable to use the tetrastyle jack, which will facilitate the confirmation of short-circuit problems such as the pinned wiring.

† The union status of the sensor must be checked before the removal of the connectors of connecting wiring (such as incomplete union, pin displacement, with impurity, and etc.)After confirm that the sensor resistance and head are free of abnormalities, centrally check the wiring and connectors.

② Notices for sensor checking

Case of sensor head line break arisen from over-pulling of sensor cable.

† When the connectors are removed during the checking of sensor, the instantaneous pulling of cable under the condition that the sensor head is fixed will cause the falloff of the internal cable of the sensor head to cause line break problem. Therefore, during the checking of sensor, do not pull the cable with the force above the specified one.

† Sensor head cable: It may be damaged when applied with above 12kgf tension force; Cable at connectors: it may be damaged when applied with above 4.5kgf tension force.

Annex II ABS Basics

Will the braking distance be shortened when equipped with ABS?

† The testing data show that the braking distance will be shortened on most road conditions (approximately 5%~20%). However, under some special road conditions (such as snowy road, non-asphalt road and rough road), the braking distance will be lengthened. However, the steering stability can be guaranteed.

What's the main objective of ABS?

† The main objective of ABS is to prevent the wheels to be locked, which has following effects:

① Maintain the vehicle stability on roads during the braking

② Capable of controlling the vehicle driving direction during braking in order to avoid the occurrence of the collision.

③ Maintain the best braking pressure, disregarding the driving skills of the driver.

Why is the ABS warming lamp illuminated?

† After the driver starts the vehicle, the warning lamp will be off when the automatic diagnosis of ABS ECU shows no trouble. If the warning lamp is illuminated during driving or the warning lamp is always on, it indicates the trouble of ABS. Please drive your vehicle to the designated service station for checking of ABS as soon as possible. However, when the warning lamp is illuminated that indicates the ABS trouble, the brake system still has the basic braking capability.

Will there be free of accident when equipped with ABS?

† ABS is the one device capable of increasing the driving safety, rather than the device used to avoid the accidents arising from the driving mistake or variation of traffic conditions. Therefore, insist on the safe driving all along rather than the excessive reliance on the ABS.

The vehicle will lean to one side during braking on the one-side-slippery road, is this phenomenon caused by ABS?

† This phenomenon is resulted from the different friction coefficients between the left and right wheels on the roads. Under such condition, the ABS will exert the special effects on the stability of the vehicle body. However, even under such condition, make sure to operate the steering wheel with car in order to avoid the occurrence of accidents.

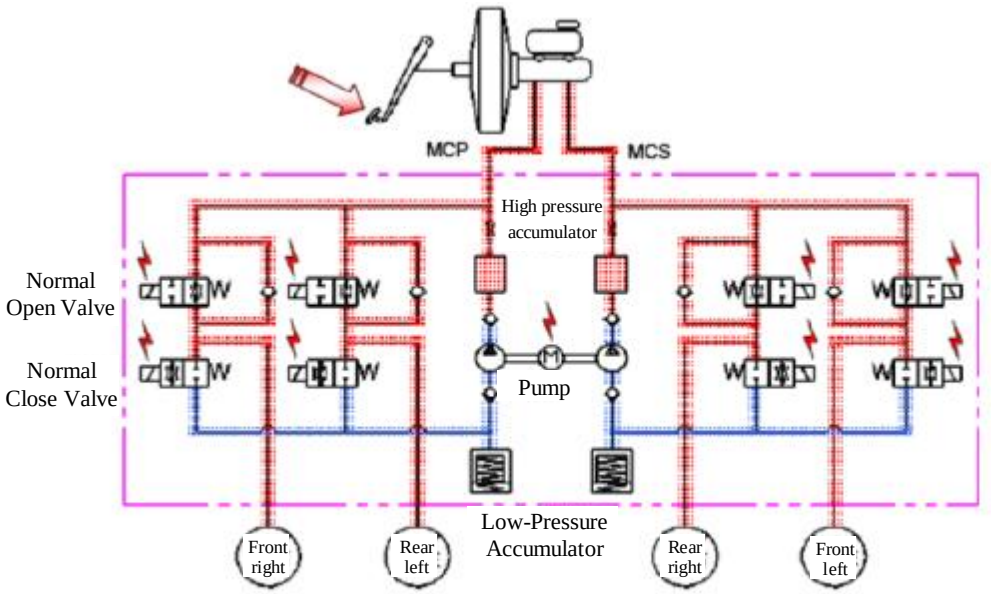
The vehicle will present the slippery phenomenon before braking during the turning on the slippery road, will the ABS function effectively when the brake pedal is depressed at that time?

† The ABS will function effectively to provide certain help depending on the vehicle speed. However, under most conditions, the outward cornering force is really big due to the vehicle inertia and therefore the body correction will have limit even the ABS is functioning.

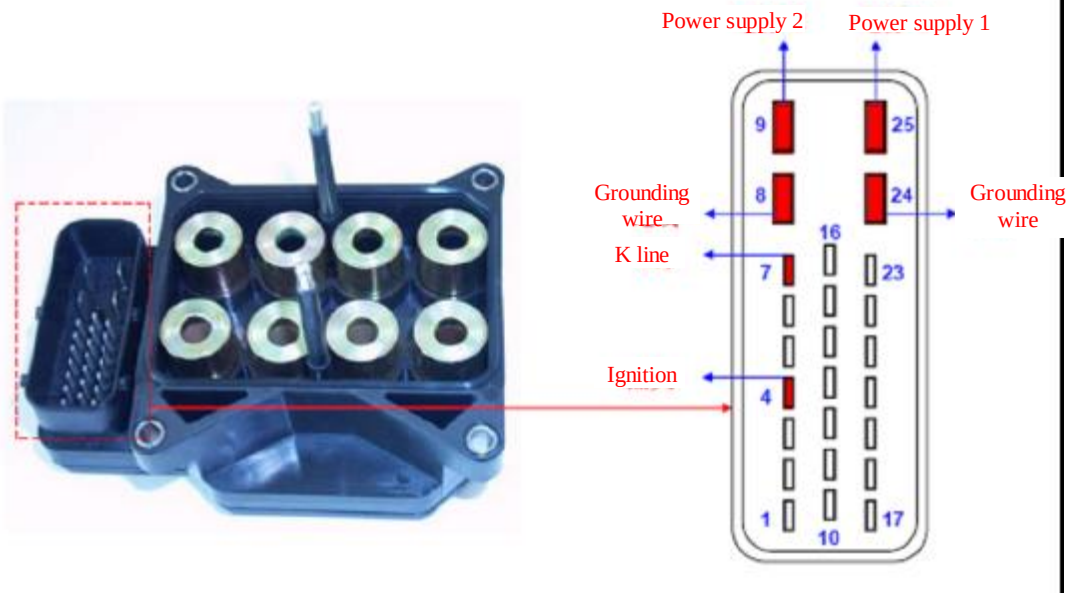
† Generally, the tires will be applied with two kinds of forces during cornering: One is the force required by driving and braking; another is the force required for vehicle steering and stability maintaining. In fact, the driving, braking and steering of the vehicle are completed though the coordination of above two forces and the two forces are in reverse ratio. Therefore, during the braking at cornering, the braking force will be increased and the force required for steering and stability maintaining will be reduced. The vehicles equipped with ABS will best coordinate these two forces. For the vehicles without the ABS, the steering performance and the stability are really weak as these two forces are not in good coordination.

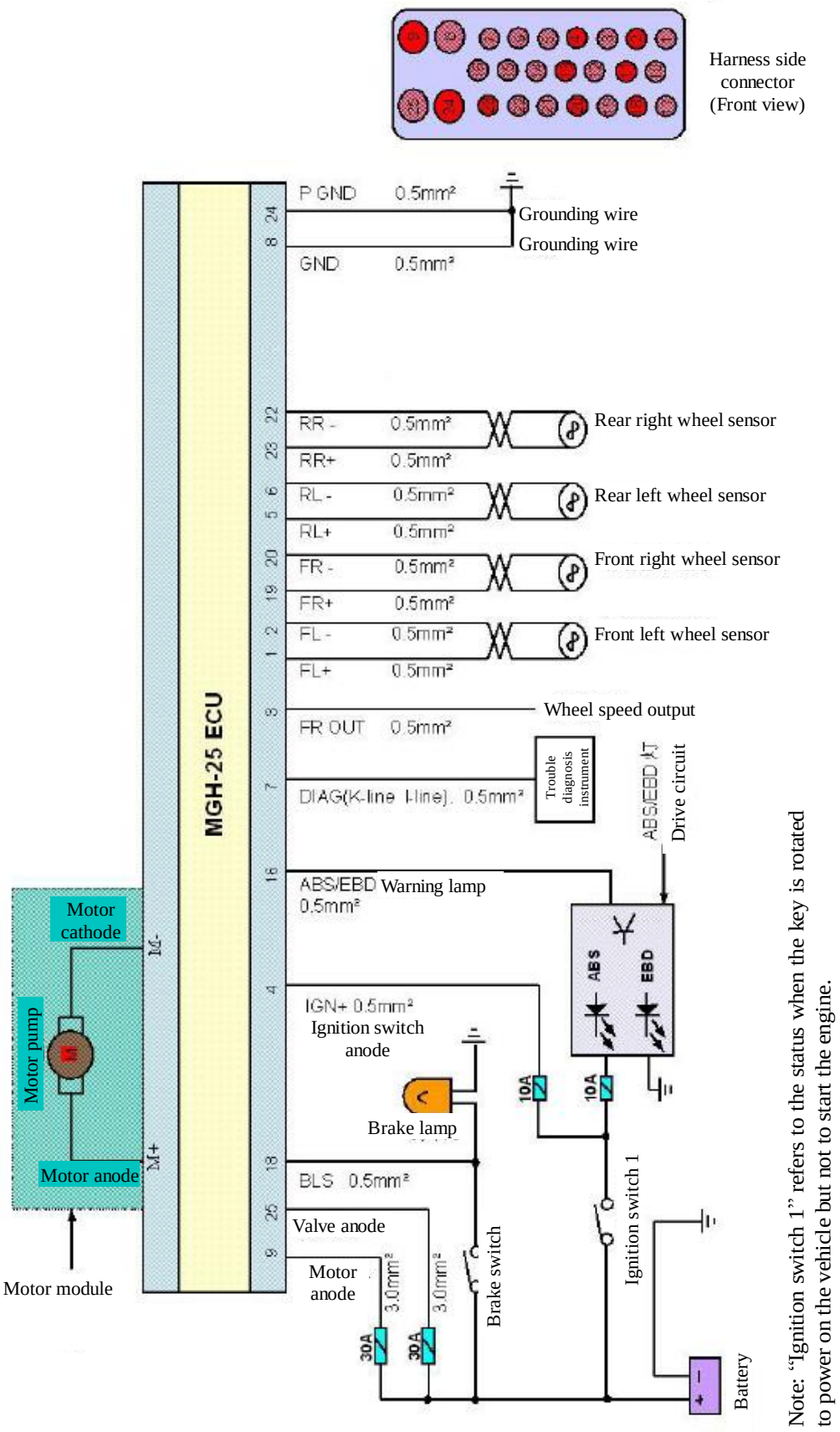
† However, under the condition that the above two forces are really small (such as: off-tracking due to excessive speed during the vehicle skid), the force for body correction is really small. Therefore, the ABS will not exert the effects. In conclusion, deceleration in advance and safe cornering is the best method.

Annex III ABS Internal hydraulic Flow Diagram



Annex IV Connector Pin Layout of MGH-25 ABS ECU





Note: "Ignition switch 1" refers to the status when the key is rotated to power on the vehicle but not to start the engine.